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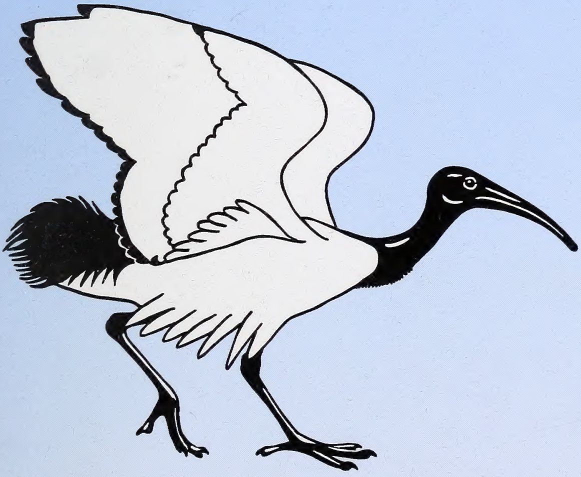
Bulletin of the British Ornithologists' Club



THE NATURAL
HISTORY MUSEUM
19 MAR 2009
PRESENTED
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Volume 129 No. 1
March 2009

MEETINGS are normally held in the **Sherfield Building** of **Imperial College**, South Kensington, London SW7. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm**. (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

Members (and) guests) that had planned to attend the talk scheduled for 3 February, which was cancelled because of bad weather, will note that it has been re-scheduled after the AGM meeting and dinner on Wednesday 29 April. This will replace the recent practice of short talks for this evening, which may be held at the June meeting if a speaker has not been found for that date.

29 April (Wednesday)—Douglas G. D. Russell (Curator, Bird Group, Natural History Museum)—*The Worst Journey in the World: an ornithological tale of bravery and endurance.* In the depths of the Antarctic midwinter of 1911 three men embarked on one of the most difficult and dangerous ornithological expeditions ever undertaken. Braving cold and misery that is difficult to imagine, they trod silently in darkness around Ross Island to retrieve three of the hardest won specimens in the Natural History Museum (NHM) bird collections. The tale of the five weeks they spent battling against the winter weather, sheer bad luck and their own fears to bring back early embryos of the Emperor Penguin, required to test a then-current theory in evolutionary biology, was superbly told by Apsley Cherry Garrard in his narrative of Scott's last expedition. Drawing on unpublished information from the NHM archives and elsewhere, the talk will précis the story itself and place it in the context of Scott's overall Antarctic research and the ornithology of the expedition as a whole.

PLEASE NOTE: this meeting will be in the Rector's Residence (Imperial College) at 170 Queens Gate, London

Applications to Hon. Secretary (address below) by **15 April 2009**

10 March—Thomas Donegan (Fundación ProAves)—*Ornithological exploration in the Colombian Andes*. Thomas and colleagues have been undertaking field expeditions in Colombia's Andes for over ten years. These have led to the description of three new species and four subspecies, two national parks and five nature reserves being established, and hosts of range extensions, rediscoveries and other findings. Colombia is one of the few countries in the world where ornithological exploration (as opposed to study of previously known areas) is still ongoing. The country's long-running civil war makes for an interesting background to ornithological exploration, as remote regions are frequently controlled by armed non-government groups. The talk will focus on explorations of two previously unstudied and geographically isolated mountain ranges, the San Lucas and Yaríguies mountains. There will be something here for everyone: joy, love, tears, toil and, of course, photographs of beautiful tropical birds.

Applications to Hon. Secretary (address below) by **24 February 2009**

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876995 (or e-mail: boc.sec@bou.org.uk).

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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

Vol. 129 No. 1 Published 14 March 2009

CLUB ANNOUNCEMENTS

Committee welcomes the following new members who recently joined the Club and have not been previously notified: Mr J. Azzopardi (Malta), D. Blamires (Brazil), Mr J. Flynn (UK), Mr A. Guimond (Canada), Mr I. Hinze (UK), Mr S. Hogberg (Sweden), Mr C. Maurizio (Italy), Mr F. Ruhe (The Netherlands) and Mr H. Smit (The Netherlands)

It is with profound sadness that we have to report the death of Dr D. W. Snow (Member 1977–2009, Editor *Bull. Brit. Orn. Cl.* 1991–97).

Members are reminded that subscriptions for 2009 were due on 1 January and are kindly asked to check that any Standing Orders are for the correct amount (£20 p.a.). Regrettably, several members are still paying incorrect subscription rates, which causes the Club unnecessary time and expense in administration duties.

ANNUAL GENERAL MEETING

The Annual General Meeting of the British Ornithologists' Club will be held in the Rector's Residence, Imperial College, 170 Queens Gate, London SW7 at 6.00 pm on Wednesday 29 April 2009.

AGENDA

1. Minutes of the 2008 Annual General Meeting (see *Bull. Brit. Orn. Cl.* 128: 73–75).
2. Chairman's report.
3. Trustees Annual Report and Accounts for 2008 (both to be distributed at the meeting).
4. The *Bulletin* Editor's report—Mr G. M. Kirwan.
5. Publications report—Revd. T.W. Gladwin, Chairman JPC.
6. Election of Officers. The Committee proposes that:
   (i) Miss H. Baker be elected *Chairman* (*vice* Cdr. M. B. Casement, OBE, RN)
   (ii) Dr R. P. Prŷs-Jones be elected *Vice Chairman* (*vice* Miss H. Baker)
   (iii) Mr S. A. H. Statham be re-elected as *Hon. Secretary*.
   (iv) Mr D. J. Montier be re-elected as *Hon. Treasurer*.
   (v) Three appointments to committee to be made (*vice* Dr R. P. Prŷs-Jones, Dr J. H. Cooper and P. J. Wilkinson) from the following nominations: S. M. S. Gregory, K. Heron Jones and C. W. R. Storey. No other changes to the committee are proposed, as all other members are eligible to serve at least one more year in office.
   Ex-officio members (in continuation): Revd. T. W. Gladwin (*Chairman Joint Publications Committee*), Prof. R. A. Cheke (*Hon. Publications Officer*), S. P. Dudley (*Administration Manager*) and G. M. Kirwan (*Hon. Editor*)
7. Any other business, of which advance notice has been given.

THE NATURAL HISTORY MUSEUM
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The 952nd meeting of the Club was held on Tuesday 23 September 2008, in the Ante Room, Sherfield Building, Imperial College, London. Fifteen members and eight guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, Dr J. H. COOPER, F. M. GAUNTLETT, D. GRIFFIN, K. HERON JONES, R. H. KETTLE, R. R. LANGLEY, D. J. MONTIER, Dr R. P. PRŶS-JONES, R. J. PRYTHERCH, P. J. SELLAR, S. A. H. STATHAM, M. J. WALTON and P. J. WILKINSON.

Guests attending were: Mrs C. R. CASEMENT, P. CASEMENT, Mrs M. CASEMENT, Mrs M. H. GAUNTLETT, Mrs J. HERON JONES, Mrs M. MONTIER, D. SERJEANTSON and Dr S. TURVEY (*Speaker*).

After dinner, Dr Samuel Turvey gave an account of *New Zealand's moa: the biology and extinction of the world's strangest birds*. New Zealand, the world's most isolated major landmass, contained a diverse endemic avifauna (*c.*245 species) prior to the arrival of humans *c.*750 years ago, which included the extraordinary large-bodied ratites known as moa. Described by Richard Owen in 1839 based on an incomplete femur, subfossil remains of these giant birds proved common in Quaternary swamp sites, dunes and caves. Ten moa species in six genera and two families are recognised today, including two species of giant moa *Dinornis*, among the largest birds ever to have evolved. *Dinornis* also displayed extreme levels of female-biased size dimorphism, representing the largest sexual dimorphism of any terrestrial vertebrate. The unfossilised state of many moa remains led 19th-century researchers to speculate that moa might still survive in remote regions of New Zealand. However, the otherwise rich Maori oral tradition contains little meaningful information on moa, and archaeological evidence, radiocarbon dating and mathematical modelling suggest that moas died out within *c.*100 years of Maori arrival. There is extensive evidence of moa hunting by early Maori settlers, with *c.*100,000–500,000 moas in known archaeological moa-hunting sites, and evidence of preferential targeting of moa compared to other birds. Discovery of cyclical growth marks in moa long bones, a feature unknown in living birds, indicates that moa took several years even to reach adult body size, and showed a hugely exaggerated K-selected life-history strategy that evolved in the absence of mammalian predators in the pre-human New Zealand ecosystem. This would have left moa extremely vulnerable to exploitation by early settlers.

The 953rd meeting of the Club was held on Tuesday 4 November 2008, in the Rector's Residence, Imperial College, 170 Queen's Gate, London. Twenty-three members and 11 guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, Mrs D. M. BRADLEY, D. R. CALDER, Ms K. COOK, D. J. FISHER, J. B. FISHER, F. M. GAUNTLETT, Revd. T. W. GLADWIN, D. GRIFFIN, K. HERON JONES, R. H. KETTLE, R. R. LANGLEY, Dr C. F. MANN, D. J. MONTIER, P. J. OLIVER, R. C. PRICE (*Speaker*), Dr R. P. PRŶS-JONES, P. J. SELLAR, S. A. H. STATHAM, C. W. R. STOREY, M. J. WALTON and P. J. WILKINSON.

Guests attending were: Mrs J. CALDER, Mrs M. H. GAUNTLETT, Mrs J. M. GLADWIN, Mrs J. HERON JONES, Mrs M. MONTIER, Mrs H. PRICE, E. PRICE, R. PRICE, W. PRICE, M. STONE and D. WITHRINGTON.

After dinner, Richard Price spoke on *The special birds of Morocco*. His many stunning photographs of the birds were set in dramatically beautiful and varied habitats, including snowy mountains, different types of desert, juniper and cedar woodlands, wetlands and the coast. First up were iconic Crimson-winged Finches *Rhodopechys sanguineus* with (Atlas) Horned Lark *Eremophila alpestris* and Seebohm's Wheatear *Oenanthe* (*oenanthe*) *seebohmi* in the Atlas Mountains, and the elusive Levaillant's Woodpecker *Picus vaillantii*, and Atlas Pied Wagtail *Motacilla alba subpersonata* of montane rivers. Tristram's Warbler *Sylvia deserticola* is endemic to the Maghreb, frequenting high hillside juniper bushes.

There are eight species of wheatear in Morocco. The scarcest is Mourning Wheatear *Oenanthe lugens* and the most beautiful Red-rumped Wheatear *O. moesta*. There are 14 species of lark, of which Thick-billed Lark *Ramphocoris clotbey* is the most extraordinary and Hoopoe Lark *Alaemon alaudipes* the most elegant, having a spectacular 'kamikaze' song-flight. Temminck's Lark *Eremophila bilopha* was illustrated performing its 'leaning' distraction display and others of note included Bar-tailed Desert Lark *Ammomanes cincturus*.

Desert Sparrow *Passer simplex* is declining but still found where there are camels. Desert Warbler *Sylvia nana* and Scrub Warbler *Scotocerca inquieta* are widespread. The much-reduced numbers of birds of prey are in stark contrast to those in neighbouring Spain. Vultures are virtually extinct. Bonelli's Eagle *Hieraaetus fasciatus* is the most likely eagle to be seen. Long-legged Buzzard *Buteo rufinus* is widespread but sparse, and all of this is probably due to poisoned carcasses put out to kill wild dogs. Lanner Falcon *Falco biarmicus* is widely encountered in deserts, Peregrine *F. peregrinus* is local, as is Barbary Falcon *F. pelegrinoides*.

Blue-cheeked Bee-eater *Merops persicus* has just two outposts at the north-west extremity of its African range. Other spectacular species are the reclusive and nomadic Houbara Bustard *Chlamydotis undulata* (gamekeepered by Middle-Eastern Arabs) and the smaller, pale Pharaoh (or Desert) Eagle Owl *Bubo bubo ascalaphus*.

Possible 'new' endemic species are (Atlas) Chaffinch *Fringilla coelebs africana*, which is boldly marked and has a green mantle (instead of a beige one), the Blue Tit *Parus caeruleus ultramarinus* which has a dark blue crown (instead of powder blue), and the very dark (male) European Stonechat *Saxicola torquatus*. Then there is the Magpie *Pica pica mauritanica*, which is slightly smaller than the well-known and widespread form, having a distinctive post-ocular patch of turquoise skin.

Along the southern coastal fringe is Black-crowned Bushshrike *Tchagra senegalus*, which is at the northern end of its range, and the white-breasted Moroccan Cormorant *Phalacrocorax carbo maroccanus*.

Northern Bald Ibis *Geronticus eremita* is, like birds of prey, much reduced from its formerly quite widespread range across Morocco, being confined to just two breeding areas at the coast. This population may prove genetically distinct from that in Syria and Turkey, although all are relict populations. Breeding success, although improved, appears to be limited by restrictions on available water. It is hoped that Chris Bowden of the RSPB, who is responsible for the conservation of this Moroccan population, will speak in more detail about this to the Club at a later date.

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Jan-Hendrik Becking 1924–2009

Born on 9 June 1924 in Blora, Java, while still in primary school Jan-Hendrik Becking began to frequent the Bogor Zoological Museum, where P. F. Franck taught him specimen preparation. By his teens he was collecting birds for the museum. Concurrently, he and his brother became friends with the Bartels brothers, Max Jr., Ernst and Hans, all eminent field ornithologists. Max Jr., 22 years his senior, became a mentor to Jan-Hendrik, making birding trips with him to remote parts of Java and permitting free access to the Bartels collection. The publication, in this issue, of his paper on fraudulent use of the Bartels egg collection, was a matter of honour to Jan-Hendrik.

After the war Jan-Hendrik wanted to study zoology in Leiden, The Netherlands, but his coming from 'the colonies' proved to be an obstacle. He thus chose botany, which also led him to meet his wife and lifelong supporter, Katharina von Wallwitz. During his professional career based in Wageningen, Jan-Hendrik became an internationally recognised specialist in nitrogen fixation by free-living and symbiotic microorganisms. Four of his contributions appeared in *Nature* and he was awarded the Pasteur medal by the French Society for Microbiology.

Indonesia, his friends there and its birds remained Jan-Hendrik's passions. In all he made 12 trips to Java. He possessed a unique combination of excellent observational, recording and analytical skills, dedication to field work (Javan Scops Owl *Otus angelinae*, Waterfall Swift *Hydrochous gigas*), a phenomenal ear (owl and cuckoo recordings, and sonograms) and painstaking laboratory skills (ultrastructure of avian egg shells). He wrote the accounts for Asian and Oceanic species in *Owls: a guide to the owls of the world* (Pica Press). Jan-Hendrik would have loved to exploit further all of the historical and ornithological information in his archives, but it was not to be. A biography of the Bartels family and a checklist of the birds of Java remain part-finished.

Joost Brouwer

REVIEW

Snow, D. 2008. *Birds in our lives.* Ebor Press, Sessions of York, Huntington Rd, York Y031 9HS. 233 pages, numerous photographs and the author's drawings and paintings, some in colour. ISBN 978–1-85072–381–3. £12.99 + £2.50 UK p&p / £3.80 (overseas surface mail).

This book is an eye-opener. Although I knew David Snow for 40 years, this book makes me realise that I had never truly known him until now. For example, I had no idea of his love of poetry and music, nor about his service in the armed forces. Far more people should write their autobiographies. It was fascinating to read about David's early life, to encounter his special sense of humour, and to learn that the great can be perfectly normal mischievous children. David Snow's navy life is fascinating, particularly to learn that a revered scientist can have led such different early life and might not have made it through.

One learns the breadth of David's interests, e.g. his interest in the Roman town of Timgad in North Africa, and of cave paintings. Similarly, I had no idea of his talent for drawing and watercolour. These exhibit such charm that one wonders why he never pursued this. Is it that he never had the time to exploit all of his many talents? His statement that when he went to Trinidad in 1956, his (perceived) inability to do justice to tropical landscapes made him give up, is tragic. On the (slim) evidence of what I've seen, he was a better watercolorist than some who make their living as book illustrators.

David's undergraduate expedition to Príncipe and São Tomé was stimulating, particularly in view of his obvious knowledge of other groups of animals besides birds. Galápagos giant tortoises, as well Pyrenean butterflies, dragonflies and hoverflies are all covered in this book. What made him specialise? The book is packed with anecdotes of his colleagues, told with wit and charm; and providing insight into those he worked with (e.g. Reg Moreau).

David's discussion of Barbara's studies on the Bearded Bellbird *Procnias averano* is fascinating, particularly as I have not read her original paper, and his account puts it in non-technical language. It also demonstrates that Barbara was a researcher in the classical style, who was prepared to spend years studying one quite small topic, unlike today's whizz-kids, who seem able to found Ph.D. theses on comparatively little.

I think David was right to say he was fortunate to have been doing his research in the period 1948–88 when one could still produce readable papers, not loaded with statistics, as now. One could add that ornithology is fortunate that David was around then to do research in that sort of way. I, for one, regret the decline in the kind of research that David was doing all those years.

Criticisms? There are some minor ones, but they in no way detract from my delight in this book, or my gratitude that it exists. For instance, on p.212, after discussing hummingbirds he mentions a large *Morpho* but it is quite unclear from the wording that this is a butterfly not a bird.

Frequently only English vernacular names for birds are used but for other groups and plants the scientific names are usually given. But I am in full agreement with David in his retention of 'old' names for birds, such as 'Hairy Hermit', in favour of the 'more prosaic' modern names. And I am absolutely behind him on the subject of multi-authored papers. There are a few repetitions, e.g. that White Bellbird *Procnias* *albus* is the only one of its genus that sounds like a bell. Much of the book reads not like a well-constructed autobiography, rather a series of 'leaves from my diary', but this is not a negative comment. One does not read a memoir to read a perfect book, but to learn something about that person. In this respect, David Snow succeeded brilliantly.

The last page, quoting a previously unpublished poem by Barbara, is deeply moving. A collection of her poems should be printed, not necessarily as a 'publication', but at least as a privately printed book for family and friends.

Michael Walters

CORRIGENDA

In *Bull. Brit. Orn. Cl.* 128(3), the following corrections should be noted. At the foot of p.150, caption to Fig. 5, after 'Tamá population', insert the words '(36125); (vii) as previous' (only six not seven specimens were identified). On p.156, Fig. 10(c) is mislabelled and should be '*G. n. nana*' not '*G. n. occidentalis*' (as stated in Appendix 1). On p.173, Appendix 1, Other Records, the locality 'Serranía de las Minas' is in Huila (not Boyacá) and 'Vereda Las Minas' is in Boyacá (not Huila).

The following table was printed incorrectly in *Bull. Brit. Orn. Cl.* 128(4): 239.

TABLE 2

List of Tumbesian EBA endemics and threatened species recorded at seven study sites (excluding wetlands). See Table 1 for site details: (1) Reserva Integral Montecaimito, (2) Mompiche, (5) Finca Integral Río Muchacho, (6) Reserva Cerro Seco, (8) Isla de La Plata, (9) Refugio de Vida Silvestre Parque Lago, (10) Cerro El Aromo. Endemism follows Stattersfield *et al.* (1998) and threat category follows BirdLife International (2008).

Species	**1**	**2**	**5**	**6**	**8**	**9**	**10**
Pale-browed Tinamou *Crypturellus transfasciatus* (NT)			*	*			
Grey-backed Hawk *Leucopternis occidentalis* (EN)	*		*				*
Rufous-headed Chachalaca *Ortalis erythroptera* (VU)	*		*				*
Brown Wood Rail *Aramides wolfi* (VU)	*						
Ecuadorian Ground Dove *Columbina buckleyi*	*	*	*			*	*
Ochre-bellied Dove *Leptotila ochraceiventris* (VU)			*				
Red-masked Parakeet *Aratinga erythrogenys* (NT)	*		*				
Grey-cheeked Parakeet *Brotogeris pyrrhopterus* (EN)			*				*
Pacific Parrotlet *Forpus coelestis*	*	*	*	*		*	*
Anthony's Nightjar *Caprimulgus anthonyi*	*	*			*		
West Peruvian Screech Owl *Otus (Megascops) roboratus*				*			
Little Woodstar *Chaetocercus bombus* (VU)	*						
Orange-fronted Barbet *Capito squamatus* (NT)	*		*				
Ecuadorian Piculet *Picumnus sclateri*				*			
Guayaquil Woodpecker *Campephilus gayaquilensis* (NT)	*		*				
Blackish-headed Spinetail *Synallaxis tithys* (EN)				*			
Collared Antshrike *Sakesphorus bernardi*				*			
Elegant Crescentchest *Melanopareia elegans*				*			
Pacific Elaenia *Myiopagis subplacens*			*	*			*
Grey-breasted Flycatcher *Lathrotriccus griseipectus* (VU)				*			
Sooty-crowned Flycatcher *Myiarchus phaeocephalus*			*	*		*	
Baird's Flycatcher *Myiodynastes bairdii*					*		
Pacific Royal Flycatcher *Onychorhynchus occidentalis* (VU)							*
Slaty Becard *Pachyramphus spodiurus* (EN)			*				
Ecuadorian Thrush *Turdus maculirostris*	*		*	*			*
Plumbeous-backed Thrush *Turdus reevei*							*
Fasciated Wren *Campylorhynchus fasciatus*				*		*	*
Grey-and-gold Warbler *Basileuterus fraseri*			*				
Black-capped Sparrow *Arremon abeillei*				*			
Crimson-breasted Finch *Rhodospingus cruentus*	*		*		*		
White-edged Oriole *Icterus graceannae*				*			

A new subspecies of Brown-banded Antpitta *Grallaria milleri* from Antioquia, Colombia

by Paul Salaman, Thomas M. Donegan & Robert Prŷs-Jones

Received 8 October 2007; final revision received 16 January 2009

SUMMARY.—A new subspecies of Brown-banded Antpitta *Grallaria milleri* is described from the northern Central Andes of Colombia, based on a single specimen at The Natural History Museum, Tring, collected in 1878 at Santa Elena, dpto. Antioquia. The new subspecies is separable from *G. m. milleri*, which occurs 140 km further south in the Central Andes, by its considerably shorter tarsus, longer wing and longer tail. Other possible hypotheses for the type specimen's morphology, such as hybridisation or clinal variation, are not supported. Searches at the type locality and in the surrounding region (which are largely deforested at suitable elevations) have failed, suggesting that the new taxon may be either highly endangered or already extinct. Although the new antpitta appears likely to be a phylogenetic species, subspecies rank is assigned conservatively. Its taxonomic rank and status will require review should an extant population be discovered.

Antpittas (Grallariidae) reach their greatest diversity at high elevations in the northern Andes. Although previously treated as part of the Thamnophilidae or Formicariidae, *Grallaria* is now considered part of a smaller family Grallariidae (Irestedt *et al.* 2002, Chesser 2004, Rice 2005a,b, Remsen *et al.* 2008). Grallariidae are secretive species of the understorey, have poor flight and often-small geographical ranges, factors that have contributed to the family being second only to Rhinocryptidae (tapaculos) in the number of new Andean taxa described recently (e.g. Graves 1987, Schulenberg & Williams 1992, Stiles 1992, Krabbe *et al.* 1999, Donegan 2008).

The Central Cordillera of Colombia is the highest (average 3,000 m) and oldest of Colombia's three Andean ranges. It supports a diverse mosaic of habitats, resulting in exceptional biological diversity and intraspecific variation (Orme *et al.* 2005, Phillimore *et al.* 2007). Above 1,000 m, the cordillera supports over 30 restricted-range bird species, one of the largest global concentrations of such montane taxa (Stattersfield *et al.* 1998). Exceptional numbers of *Grallaria* species occur in Colombia's Central Andes, including various endemics to the cordillera (Krabbe & Schulenberg 2003).

During the late 19th and 20th centuries, improved infrastructure encouraged bird collectors to explore the northern Central Cordillera, mainly around Colombia's second-largest city, Medellín, with collections by M. A. Carriker (1941–53: Graves 1987, 1997), K. von Sneidern (1938–52: Fjeldså & Krabbe 1990), M. A. Serna (1971–91: SAO 2003) and several American Museum of Natural History (AMNH) expeditions (Chapman 1912, 1917). In the last decade, the northern Central Andes has again been a focus for ornithological research due to the activities of many individuals and groups, including the Sociedad Antioqueña de Ornitología, Medellín's universities, and Fundación ProAves (e.g. Salaman *et al.* 2002, SAO 2003), among others. Despite the region having been better studied than many other parts of the country, the Central Andes have yielded several new bird species in recent years, including two found to date only in the northernmost section, in dpto. Antioquia (Cuervo *et al.* 2001, Donegan 2007).

One of the first significant collections from the northern Central Andes was made by Thomas Knight Salmon, who collected 1,263 bird specimens for the British Museum, now the Natural History Museum (BMNH), in 1872–78. Details, including type specimens of 14 species, were published just after Salmon's death (Sclater & Salvin 1879). Previously, Sclater (1877) had described *Grallaria flavotincta* from a single adult (BMNH 1889.9.20.622) taken by Salmon near Frontino, Antioquia, in 1876. Among the specimens in Salmon's last consignment, collected in September 1878, was an unidentified, plain brown-plumaged *Grallaria* (BMNH 1889.7.10.875). Although details of it were not mentioned by Sclater & Salvin (1879), they did comment on other specimens collected during the same month and referenced the holotype of *G. flavotincta*. The label of 1889.7.10.875 was originally annotated simply '*Grallaria*', but the species name was later added '*flavotincta*' (i.e. Yellow-breasted Antpitta) in a different hand, almost certainly that of P. L. Sclater (handwriting compared against a signed letter). In his account of the Formicariidae for the *Catalogue of the birds in the British Museum*, Sclater (1890) referred to the specimen as a juvenile *G. flavotincta*, although there is no reference to its age on the labels.

Norman Arlott was commissioned to illustrate various antpittas for the *Handbook of the birds of the world* (*cf.* Krabbe & Schulenberg 2003) and, to this end, in 2001 he visited BMNH. His draft plate for *G. flavotincta* was based solely on specimen 1889.7.10.875, as the holotype was stored in a separate cabinet and BMNH held no other specimens. However, NA soon discovered that his illustration did not match the species' draft text description. *G. flavotincta* is a yellow-breasted endemic of the West Andes, whilst the BMNH skin has dull grey and brown underparts. NA raised the issue with RP-J, and on comparing the specimen with the holotype they realised it could not be of the same species. In early November 2001, PS visited the collection in connection with Project BioMap's databasing of Colombian skins and, on seeing the mystery '*G. flavotincta*' specimen, realised that it more closely recalled Brown-banded Antpitta *G. milleri*. On comparing the single *G. milleri* held at BMNH, a paratype, PS and RP-J noted that the specimen differed from *G. milleri* in various respects.

The incorrect identification of a museum specimen is not uncommon, but in this case it is rather surprising. Sclater described more *Grallaria* species than anyone else, in chronological order: White-bellied Antpitta *G. hypoleuca* and *G. modesta* (now the Thrush-like Antpitta subspecies *Myrmothera campanisona modesta*) (Sclater 1855), Chestnut-naped Antpitta *G. nuchalis* (Sclater 1860), Grey-naped Antpitta *G. griseonucha* (Sclater & Salvin 1871), *G.* [*nuchalis*] *ruficeps* (Sclater 1874a), Red-and-white Antpitta *G. erythroleuca* (Sclater 1874b), Rufous-faced Antpitta *G. erythrotis* (Sclater & Salvin 1876), Yellow-breasted Antpitta *G. flavotincta* and Plain-backed Antpitta *G. haplonota* (Sclater 1877), Bicoloured Antpitta *G. rufocinerea* (Sclater & Salvin 1879) and Ochre-striped Antpitta *G. dignissima* (Sclater & Salvin 1880). Particularly noteworthy is that Sclater described *G. flavotincta*.

The collecting locality, Santa Elena, is immediately adjacent to the city of Medellín, and now on the road between the city and its airport. The region had been deforested by the early 1900s (Chapman 1917) and there is little native vegetation today, with pine plantations and other modified habitats predominant (Castaño & Patiño 2000). Recent surveys yielded only 66 bird species. The largest forest fragment covers just 136 ha and the only Grallariidae is the widespread Chestnut-crowned Antpitta *G. ruficapilla* (Castaño & Patiño 2007). Many forest-dependent species collected at the locality by Salmon, including *Grallaria rufocinera* and Slate-coloured Antpitta *Grallaricula nana*, are no longer present.

Interestingly, Bicoloured Antpitta *G. rufocinerea* also has Santa Elena as its type locality but was not recorded in Antioquia for 130 years until its recent rediscovery at a site 18 km south-east of Santa Elena, at San Sebastián-La Castellana, El Retiro municipality (Ramírez 2006). San Sebastián is considered the best-preserved montane forest fragment (200 ha) in southern Antioquia and has been subject to much observation over the past decade. It was recently declared an Important Bird Area (Franco & Bravo 2005). *G. ruficapilla*, *G. nuchalis* and *Grallaricula nana* have been found there, but there are no records of *G. milleri* (J. D. Ramírez *in litt.* 2008).

During 2008, Fundación ProAves undertook eight weeks of intensive surveys for *Grallaria* species at seven potential sites within 80 km of Santa Elena and at similar elevations, including the use of regular playback of *G. milleri*. These searches failed to locate *G. milleri* or any similar taxon. Efforts to obtain a useful mtDNA sequence from toe pad scrapings of the mystery BMNH (1889.7.10.875) specimen have also failed, probably because of the specimen's age (N. H. Rice *in litt.* 2006).

Description of new subspecies

We believe that the BMNH skin represents a new taxon and that further delay in alerting ornithologists and conservationists to its existence is not warranted. Given the lack of vocal or molecular data, we conservatively assign it subspecies (rather than species) rank and propose the following name:

Grallaria milleri gilesi subsp. nov.
Antioquia Brown-banded Antpitta

Holotype.—See Figs. 1 and 2. Male, reg. no. BMNH 1889.7.10.875, held at the Natural History Museum, Tring, UK; collected in September 1878 by T. K. Salmon (original collector's no. 41) at Santa Elena, 8 km east of Medellín, dpto. Antioquia, Colombia (06°15'N, 75°35'W). Elevation unknown, but within a 10-km radius of Santa Elena elevation does not exceed 2,750 m, with a mean of 2,550 m (http://earth.google.com). The label notes the iris as 'dark' and stomach contents included 'insects'.

Diagnosis.—Referred to *Grallaria* Vieillot, 1816 (type: Variegated Antpitta *G. varia*) due to: its medium to large size; long tarsus; culmen very indistinctly (if at all) ridged and gradually but strongly curved from the base; scutellate tarsus; rictal bristles distinct but slender; and chin and upper-throat feathers with long, slender terminal setae (Lowery & O'Neill, 1969). *Grallaria* was treated as comprising several subgenera by Lowery & O'Neill (1969); although some of their proposed subgeneric divisions do not reflect molecular findings (Krabbe & Schulenberg 2003), they are nonetheless of use in considering the possible relations of *G. m. gilesi*. *G. m. gilesi* is apparently a fairly typical member of the plain-coloured group (proposed subgenus *Oropezus* Ridgway, 1909; type species: Rufous Antpitta *G. rufula*), of which *G. milleri* is a member, due to: its relatively small wing (75–103 mm); fairly uniform upperparts and underparts (considered separately) without strong streaks, squamations or bars; tail more than half as long as wing (tail / wing ratio 0.54–0.60); inner edge of tarsus distinctly convolute; and presence of 12 rectrices (Lowery & O'Neill, 1969). However, *G. m. gilesi* falls outside of proposed tarsus / tail and tarsus / wing ratios for the subgenus.

The new taxon immediately recalls *G. m. milleri*, which occurs 140 km further south in the Central Andes (Fig. 3). The holotype shares *G. m. milleri*'s uniform rufous-brown plumage, with whitish lores, throat and belly, and the structural features described for the proposed subgenus *Oropezus* and genus *Grallaria* above. Based on recorded values for *G. milleri* from specimens (n=10) and recent field and specimen measurements (Kattan & Beltrán 1999: n=18), the *G. m. gilesi* holotype differs from all *G. m. milleri* specimens in hav-

TABLE 1

Comparison of morphometrics of *G. m. gilesi* with *G. m. milleri* (specimens unless otherwise stated). Details of measured specimens are presented under distribution. The mean is given, followed by the standard deviation and then the range, with Kattan & Beltrán (1999) data also presented for comparison.

	Flat wing chord (mm)	Tail length (mm)	Tarsus length (mm)	Maxilla (mm)*	Bill width (gape) (mm)	Body mass (g)	Tail/tarsus ratio	Wing/ tarsus ratio
G. m. gilesi (holotype, male)	97.0	55.8	40.8	18.8	12.7	N/A	1.37	2.38
G. m. milleri (*n*=5 males)	89.1 ± 3.5 (85.0–94.5)	50.4 ± 1.4 (49.2–52.5)	44.4 ± 0.5 (44.0–45.2)	21.1 ± 1.4 (19.5–23.1)	11.3 ± 0.7 (10.3–11.8)	N/A	1.13 ± 0.04 (1.09–1.19)	2.00 ± 0.10 (1.88–2.13)
G. m. milleri (*n*=10)	88.6 ± 2.9 (85.0–94.5)	49.0 ± 2.9 (43.6–53.0)	44.5 ± 0.6 (43.4–45.5)	21.0 ± 1.9 (19.3–24.7)	11.5 ± 1.0 (10.3–13.0)	N/A	1.10 ± 0.06 (0.98–1.19)	1.99 ± 0.08 (1.88–2.13)
G. m. milleri (Kattan & Beltrán 1999) (*n*=18 live individuals and specimens)	89.6 ± 3.5	N/A	46.6 ± 2.4	17.1 ± 1.5	N/A	52 ± 3.2	N/A	Based on means: 1.92

* Differences between Kattan & Beltrán (1999) data and ours for maxilla length probably result from differences in measuring technique.

ing a longer wing, longer tail and shorter tarsus (Table 1). It also appears larger bodied than *G. m. milleri*.

Description of the holotype.—The following is based on Munsell Color (2000) codes. *Face* Lores white (Gley 1, 7–8/N) with dark brown feather tips. Ear-coverts warm cinnamon-brown (10YR 3/6) with slightly darker feather tips outlining ear-coverts. Warm cinnamon-brown (10YR 3/6) from ear-coverts to neck-sides and upper breast, forming a breast-band. *Upperparts* Entire upperparts, from the forecrown to the uppertail-coverts, uniform rufous-brown (10YR 3/4). Tail slightly darker rufous-brown (7.5YR 2.5/3). *Wings* As upperparts, with uniform rufous-brown (10YR 3/4) coverts and flight feathers with warm cinnamon-buff (10YR 3/6) underwing-coverts. *Underparts* Throat white (Gley 1 8/N) with warm cinnamon-brown (10YR 3/6) feather tips. Feather tips below culmen modified with exposed, elongated terminal setae, similar in shape (and, doubtless, function) to rictal bristles. Lower underparts to undertail-coverts pale grey (10YR 6/1), being slightly paler whitish and creamy on central belly (10YR 6/3). Sides of throat and malar region pale cinnamon-buff (10YR 3/6), extending around throat to form a distinctive upper-breast-band and extending as broad streaks on mid to lower breast and over flanks. The streaking comprises broad cinnamon (10YR 3/6) fringes to pale grey (10YR 6/1) feathers and darkens to cinnamon-rufous (10YR 3/4) on mid to lower flanks and thighs. *Soft parts* Tarsus scutellate. Irides 'dark' on collection. No bill or leg colour description, but presently faded as in *G. milleri*, with tarsus and culmen dark horn, tipped yellowish horn (10YR 5/6) on both mandibles. See Figs. 1 and 2.

Distribution and specimens examined.—*G. m. gilesi* is known only from the type locality above the Valle de Aburrá, 8 km east of Medellín, Santa Elena municipality, dpto. Antioquia, Colombia (06°15′N, 75°35′W; 2,750 m). The locality is 140 km north of the northernmost known locality of its apparently closest relative, *G. m. milleri*. The holotype was collected within the elevational range of *G. m. milleri* (1,800–2,800 m), suggesting the two taxa may replace one another geographically.

Details are presented below for known localities of *G. m. milleri*. Project BioMap staff and ourselves (*) checked all specimens of *G. milleri* in the following museums: American Museum of Natural History, New York (AMNH*), Academy of Natural Sciences, Philadelphia (ANSP), Natural History Museum, Tring (BMNH*), Instituto de Ciencias Naturales, Universidad Nacional, Bogotá (ICN*), Carnegie Museum, Pittsburgh, USA (CM*) and Museum of Comparative Zoology, Harvard University, Cambridge, MA (MCZ). Recordings from www.xeno-canto.org (XC) were also examined. *G. m. milleri* is currently confirmed to occur only in the middle section of the Central Cordillera in central Colombia, at the following localities south to north:

1. Reserva Natural de las Aves El Mirador (04º09′N, 75º44′W; 2,750 m), sound-recorded, trapped and photographed by Fundación ProAves researchers in 2006 and others subsequently (Alonso Quevedo *et al.*; N. Athanas & F. Lambert: XC 10721, 16777).
2. Río Toche watershed, municipalities of Cajamarca and Ibagué, south-east flank of the Volcán Tolima-Ruiz massif, dpto. Tolima (04°26′N, 75°22′W; 1,800–2,600 m) (López-Lanús *et al.* 2000).
3. Clarita Botero, above Ibague, dpto. Tolima (04º29′N, 75º13′W; 2,100 m) (M. Moreno-Palacios *in litt.* 2007).
4. Reserva Natural Ibanasca, Cañon del Río Conbeima, dpto. Tolima (04°35′–38′N, 75°14′–19′W; 2,400–2,800m) (M. Moreno-Palacios & D. A. Bejarno-Bonilla *in litt.* 2007).
5. Laguneta (type locality), dpto. Quindío (04º35′N, 75º30′W); specimens at AMNH (111991–94), BMNH (1921.7.3.61, formerly AMNH 111990), MCZ (81785, formerly AMNH 111995)—a small montane forest patch at 2,700–2,800 m on the west slope of the Central Cordillera (Chapman 1912).
6. Above Salento, dpto. Quindío (04º38′N, 75º34′W; 2,745 m); male collected on 6 November 1911 (AMNH 111996) (Chapman 1917) and two males in April 1942 (ANSP 154007–08).
7. Finca San Miguel, 3 km west of Roncesvalles, dpto. Tolima (04°53′N, 75°30′W′ 2,750 m) (Cadena *et al.* 2007).
8. Ucumarí Regional Natural Park, dpto. Risaralda (04°42′N, 75°29′W; 2,200–2,600 m). Surveys in 1994–98 yielded 11 birds trapped and six collected (Universidad del Valle 6171, 6178–82: Kattan & Beltrán 1997, 1999).
9. Río Blanco, Manizales, dpto. Caldas (05°05′N, 75°25′W; 2,500 m) (ICN 35692; Verhelst *et al.* 2002, Nieto & Ramírez 2006; B. Davis, D. Bradley, H. van Oosten, A. Spencer & O. Cortés: XC 13896, 17619, 18289, 20505 and 22213).
10. Sancudo (= El Zancudo), 3 km east of Manizales, dpto. Caldas (*c.*5º05′N, 75º30′W; 2,400 m), where a female was collected (CM 70234) in August 1918.
11. Two 'Bogotá' specimens (AMNH 43555, 43559) were presumably collected in the Central Andes.

The modelled distribution of *G. m. milleri* by J. Velásquez (*in litt.* 2008) using MAXENT 3.0 (Phillips *et al.* 2006) based on topography and climate layers available from Worldclim (Hijmans *et al.* 2005) predicts presence north to Antioquia (Fig. 3). Interestingly, there are no geographical barriers (e.g. significant dry valleys or high mountains) preventing contact

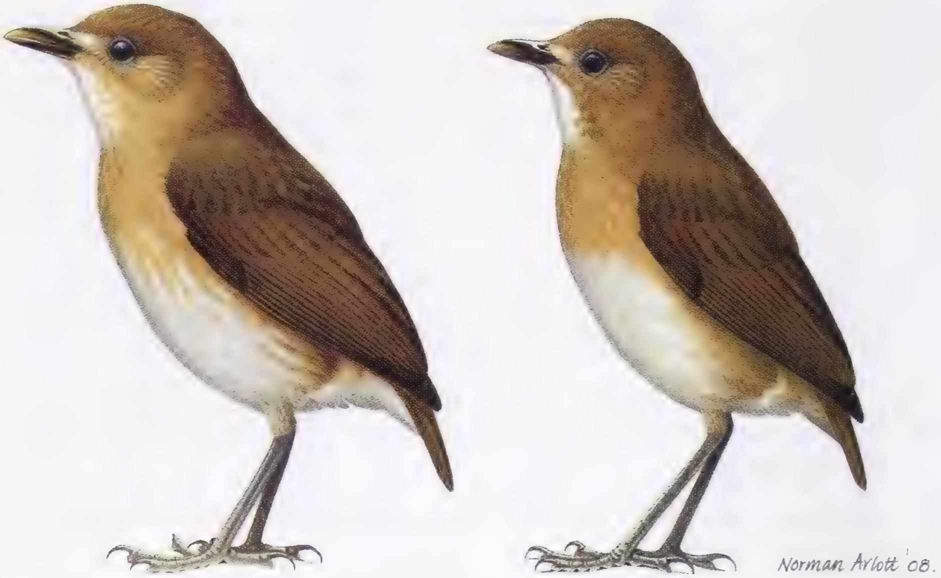
Norman Arlott '08.

Figure 1. Plate by Norman Arlott showing *Grallaria m. gilesi* (left) and *Grallaria m. milleri* (right).

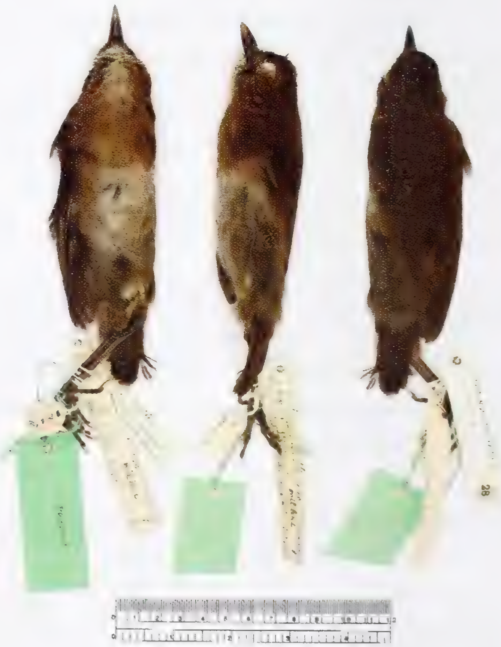

Figure 2. The *Grallaria m. gilesi* holotype (left three images) and *Grallaria m. milleri* paratype (right three images). © Natural History Museum, Tring.

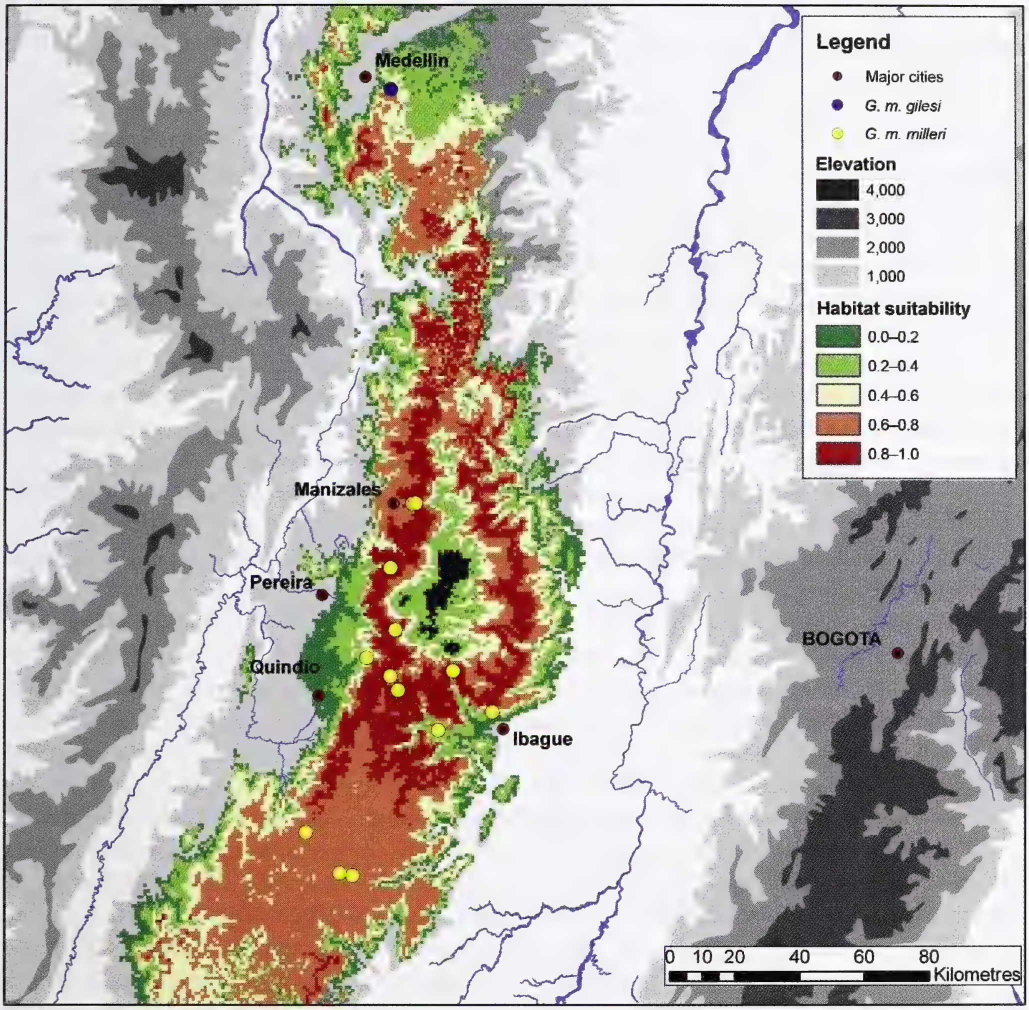
Medellin
Manizales
Pereira
Quindio
Ibague
BOGOTA
Legend
Major cities
G. m. gilesi
G. m. milleri
Elevation
4,000
3,000
2,000
1,000
Habitat suitability
0.0–0.2
0.2–0.4
0.4–0.6
0.6–0.8
0.8–1.0
0 10 20 40 60 80
Kilometres

Figure 3. Potential distribution map for *G. milleri*, by J. Velázquez, using MAXENT 3.0 (Phillips *et al.* 2006) and showing locations of records of *G. milleri* and the type locality of *G. m. gilesi* in Colombia, with potential distribution based on topography and climate layers available from Worldclim (Hijmans *et al.* 2005).

between *G. m. milleri* and *G. m. gilesi*, but there is a region showing reduced potential suitability for *G. milleri* between the known range of *G. m. milleri* and the type locality of *G. m. gilesi*. Potentially suitable climatic variables for *G. milleri* are present above Santa Elena, with precipitation (1,887 mm) and temperature (max. 15.3°C) within ranges of these variables at sites where *G. m. milleri* has been recorded (mean rainfall = 1,769 mm; range = 1,178–2,493 mm; mean temperature = 14.0°C; range = 9.8°C–19.2°C: Hijmans *et al.* 2005). However, *G. m. milleri* has been recorded to date only on the slopes of *c.*4,000 m or higher massifs and at lower latitudes.

Despite climatic similarity, the pattern of a northern subspecies replacing one found further south in the Central Andes is not uncommon. Examples of montane understorey species showing apparently similar north–south subspecies replacements in the Central Andes include those of Yellow-breasted Brush Finch *Atlapetes latinuchus elaeoprorus* and *A.l. caucae* (Donegan & Huertas 2006) and Lacrimose Mountain Tanager *Anisognathus lacrymo-*

sus olivaceiceps and *A.l. palpebrosus* (Zimmer 1944). The *Anisognathus* taxa intergrade in dpto. Caldas, but the historical factors underlying these distributions are little studied.

Taxonomic rank.—The following statistical methods were suggested by Donegan (2008) as guidelines for assessing diagnosability and rank where two allopatric populations are compared for continuous, normally distributed variables but where, for one population, there is a sample size of only one. In the formulae below, y is the recorded value for the *G. m. gilesi* type specimen; $\bar{\chi}_1$ and s_1 are the sample mean and sample standard deviation of *G. m. milleri*; and the t value uses one-sided confidence intervals at the percentage specified for the degree of freedom for *G. m. milleri* when considering the relevant variable. Tests are based on the highly conservative assumption that the *G. m. gilesi* holotype has unusual biometrics at the highest or lowest 2.5% for each variable studied (whichever is furthest from the *G. m. milleri* mean). Tests also assume that *G. m. gilesi* has similar sample population variance for the relevant variable to *G. m. milleri* and that *G. m. gilesi* does not represent the extreme of a cline, a hypothesis discussed further below.

(A) Traditional '75% / 99%' test for subspecies (Amadon 1949, Patten & Unitt 2002): $y < \bar{\chi}_1 - (t_{99.0\%} + t_{97.5\%} + t_{75.0\%})\, s_1$ or $y > \bar{\chi}_1 + (t_{99.0\%} + t_{97.5\%} + t_{75.0\%})\, s_1$.

(B) Isler *et al.*'s (1999) phylogenetic species test (97.5% / 97.5% diagnosability), adapted: $y < \bar{\chi}_1 - 3 s_1 t_{97.5\%}$ or $y > \bar{\chi}_1 + 3 s_1 t_{97.5\%}$.

A Welch's t-test to compare means (Level 1 of Donegan 2008) is not assessable where only one datum is available for one population. However, var-covar principal components analysis using PAST v1.46 found the *G. m. milleri* specimen to fall outside the 95% ellipse for *G. m. milleri*, using data both from all specimens and from males alone. The *G. m. gilesi* holotype falls outside the range of the *G. m. milleri* sample in wing, tail and tarsus lengths, commissure width (males only), tail / tarsus ratio and wing / tarsus ratio.

Based on data for both sexes of *G. m. milleri* (d.f.=9 for *G. m. milleri*), *G. m. gilesi* passed the 75% / 99% test for subspecies rank for tarsus length (missing the phylogenetic species test by only 0.2 mm or $0.16ts_1$). Based on data for males alone (d.f.=4 for *G. m. milleri*), *G. m. gilesi* passed the 75% / 99% test for subspecies rank for bill width at gape (missing the phylogenetic species test by 0.1 mm or $0.03ts_1$) and tarsus length (missing the phylogenetic species test by 0.3 mm or $0.18ts_1$). *G. m. gilesi* would pass a test for phylogenetic species rank for tarsus length for both males and combined data were the holotype assumed to fall within the most unusual 5% of the hypothetical *G. m. gilesi* population (vs. the most unusual 2.5%, as under the present model). Thus, mensural data suggest that *G. m. gilesi* is at least a subspecies under the Patten & Unitt (2002) 75% / 99% concept, and is also likely a phylogenetic species on biometrics (Cracraft 1983).

Helbig *et al.* (2002) and Remsen (2005) suggested that, to assess taxonomic rank of allopatric populations, a comparison should be undertaken of the observed differences between (i) candidates for species rank and their possible conspecifics; and (ii) congeners known to be good species. *Grallaria* is hardly a model group for such comparisons given that current species limits are poorly defined and frequently a result of historical momentum rather than detailed study (Krabbe & Schulenberg 2003, Remsen *et al.* 2008). Nonetheless, several cases of morphologically rather similar *Grallaria* populations considered biological species (due to sympatry or vocal differences) exist, such as Scaled *G. guatemalensis* and Moustached Antpittas *G. alleni*, and *G. hypoleuca* and *G. flavotincta*. In these species-pairs, morphological differences are subjectively rather small. In *Grallaricula nana*, the only allopatric populations diagnosable by biometrics also have diagnosably different voices and, as here, tarsus length differed markedly between those populations (Donegan 2008).

We conservatively rank *G. m. gilesi* as a subspecies (allospecies) of *G. milleri* pending any vocal or molecular data becoming available. Further data might demonstrate *G. m. gilesi* to be worthy of species rank. Its status should also be re-evaluated as more is learned about the relationship between biometric and vocal variation in *Grallaria*.

Possible other hypotheses.—Describing a new bird taxon based on just one specimen without vocal or molecular data might be considered controversial (e.g. Remsen *et al*. 2008 comments on Graves 1993). However, the other possible alternatives—an aberrant individual of *G. milleri*, clinal variation or a hybrid—are unsupported by the available data.

Hybridisation is exceptionally rare among suboscines other than the Pipridae (e.g. Marini & Hackett 2002, McCarthy 2006), although one case has been documented in *Grallaria* (Cadena *et al*. 2007). Any hybridisation hypothesis would necessarily involve *G. milleri* and would therefore seem biogeographically unlikely, as there are no records of *G. milleri* in the northern Central Andes. Furthermore, *G. m. gilesi* is indistinguishable from some *G. m. milleri* in plumage, meaning that one possible hybrid parent would have influenced only the biometrics of its offspring and left no trace on its plumage.

Assuming that a small population of *G. m. milleri* occurred at or near the type locality of Santa Elena, other possible sympatric *Grallaria* in the Central Andes (not all confirmed to occur in the north) are Undulated *G. squamigera*, Chestnut-naped *G. nuchalis*, Chestnut-crowned *G. ruficapilla*, Bicoloured *G. rufocinerea*, Tawny *G. quitensis*, Scaled *G. guatemalensis*, Moustached *G. alleni*, Rufous *G. rufula*, Plain-backed *G. haplonota* and White-bellied Antpittas *G. hypoleuca*. Of these, *G. milleri* is known to be sympatric only with *G. squamigera*, *G. nuchalis*, *G. ruficapilla* and *G. rufocinerea* (Kattan & Beltrán 1997, Krabbe & Schulenberg 2003) and only *G. rufocinerea*, *G. hypoleuca*, *G. nuchalis*, *G. alleni* and *G. ruficapilla* are known from Antioquia (Hilty & Brown 1986, SAO 2003). Sclater's 'confusion species' *G. flavotincta* is replaced in the Central Andes by *G. hypoleuca* (Krabbe & Schulenberg 2003), so the former is not a plausible parent species.

It is generally expected that hybrids would show intermediate features between their parents (Graves 1990, 1992). No examples of heterosis were noted in the only known case of hybridisation in *Grallaria* (Cadena *et al*. 2007); i.e. the only known hybrid *Grallaria* fell within the range of parent species in biometrics and had intermediate plumage features. Of other *Grallaria* occurring in the Central Andes, *G. squamigera*, *G. guatimalensis*, *G. alleni*, *G. nuchalis*, *G. rufocinerea* and *G. ruficapilla* are so different in plumage from *G. m. gilesi* that they can confidently be excluded as possible parents. None of the *Grallaria* species known to be sympatric with *G. milleri* bears any real resemblance to *G. m. gilesi* in plumage.

Potential parents with nondescript plumage similar to *G. milleri* are *G. hypoleuca*, *G. quitensis* and *G. rufula*. However, none of these is known to be sympatric with *G. milleri* and none is known from the Santa Elena region. *G. hypoleuca* is a vocal species, currently known in Antioquia only from the more humid northern slope of the Central Andes at río Porce, Anorí and Amalfí (Donegan & Salaman 1999), and from older specimens taken at a single locality also on the north slope (Valdivia, Antioquia: USNM 402471–472, FMNH 299492). It has not been recorded at San Sebastián (J. D. Ramírez *in litt*. 2008), nor is it known from historic material taken in the Medellín region or further south in dptos. Quindío or Caldas, despite considerable ornithological work. *G. quitensis* occurs only in very high-elevation *páramo*, as does *G. rufula*. None of these possible hybrid combinations explains *G. m. gilesi*'s morphometric characters. *G. hypoleuca* (46–49 mm: *n*=5) and *G. quitensis* (*c*.50 mm; *n*=1: ProAves unpubl. data) have longer, not shorter, tarsi than *G. milleri*, whilst the Central Andes population of *G. rufula* is shorter tailed than *G. milleri* (40.0–42.2 mm; *n*=3: ProAves unpubl. data) and is smaller bodied (mass 40.4–42.0g; *n*=3: ProAves unpubl. data). The larger body, longer tail and shorter tarsus in *G. m. gilesi* permit us to discount these hybrid hypotheses.

G. m. gilesi is unlikely to represent an extreme point of clinal variation within *G. m. milleri*. Bergmann's Rule holds that populations from cooler (here, northern) regions are generally larger bodied. *G. m. gilesi* has a larger body and longer wing and tail than *G. milleri*, which might reflect this. Individuals measured by Kattan & Beltrán (1999) in dpto. Risaralda and the ICN specimen show longer tarsi and slightly longer wing lengths on average than our dpto. Quindío specimen data, in accordance with Bergmann's Rule or possibly reflecting shrinkage in older skins. However, *G. m. gilesi*'s considerably shorter tarsus reverses the general trend observed in *G. milleri* or expected under Bergmann's Rule. Although there are exceptions to Bergmann's Rule in Andean birds and the sample size is small, observed variations in tarsus length are not consistent with a hypothesis of clinal variation.

G. m. gilesi is clearly not a case of an aberrant individual showing 'gigantism', given that its tarsus is shorter than that of *G. m. milleri*.

Sclater (1890) considered the *G. m. gilesi* holotype to be possibly a juvenile. There is some variation in the intensity of rufous plumage in *G. m. milleri*, with AMNH 111991 and 111994 (the holotype) and the *G. m. gilesi* holotype being more rufous than other specimens. The more olivaceous plumage of other AMNH specimens and the BMNH specimen was considered by Chapman (1912) to result from traces of juvenile plumage, a hypothesis supported by the broadly streaked crown of AMNH 111993, clearly a juvenile feature, and its more olivaceous plumage. The pattern of age-related plumage variation in *G. m. milleri* suggests that the *G. m. gilesi* holotype is probably adult (whilst the BMNH *G. m. milleri* paratype is a juvenile) and that Sclater's (1890) note may have been no more than an attempt to explain the differences between it and *G. flavotincta*.

Finally, Tepui Antpitta *Myrmothera simplex* of the Venezuelan and Guianan tepuis is almost identical in plumage to *G. milleri* (Lowery & O'Neill 1969), but *G. m. gilesi* is clearly not a mislabelled *Myrmothera* given its long rictal bristles and more strongly scutellate tarsus.

The description of *G. m. gilesi* is given further weight by the recent discovery of an undescribed species of *Grallaria* by Fundación ProAves researchers in the northernmost West Andes. Its closest relative appears to be *G. milleri*, but it differs in a number of plumage and vocal characters. Notably, the undescribed species is larger bodied and longer winged than *G. m. milleri* (like *G. m. gilesi*) but does not share the short tarsus of *G. m. gilesi*. Biogeographic and biometric considerations suggest that the undescribed species may be closer related to *G. m. gilesi* than to *G. m. milleri*.

***Ecology and behaviour*.**—Beyond its insectivorous diet, *per* the specimen label, no ecological information is available.

***Etymology*.**—The epithet honours O. A. Robert Giles, who has been dedicated to the conservation and study of Colombian avifauna since the early 1990s. He has personally supported the creation of two reserves for threatened birds in Antioquia by Fundación ProAves (Arrierito Antioqueño and Loro Orejiamarillo Bird Reserves) and a further two bird reserves elsewhere in Colombia (Reinita Cerúleo and Hormiguero de Torcoroma Bird Reserves). Robert has travelled extensively in Colombia and aided Colombian ornithology by sponsoring research. Colombia's birds are safer due to his generosity and dedication.

Conservation.—The Cordillera Central of Colombia has undergone massive ecological change as Colombia's prime coffee-growing region and represents one of the most human-altered landscapes in the northern Andes. The extensive deforestation of montane forests in the northern Central Andes justifies immediate conservation action for range-restricted taxa found there. Given that searches for the new taxon in remnant forests in the northern Central Andes failed, there is only a remote possibility that *G. m. gilesi* is not already extinct.

Presently, *G. milleri* is considered Endangered (EN: B1a+b(iii,v), VU: C2a(i); D1) with an estimated Extent of Occurrence of 660 km^2 and known from 2–5 locations (BirdLife International 2008). The information presented here expands the known localities and range of G. *milleri*, although we believe the species remains Endangered (EN: B2b(ii,iii,v), VU: C2a(i)).

G. m. gilesi (when considered separately from *G. m. milleri*) is best categorised as IUCN Critical under category D1, based on a precautionary estimate of its population as <50 mature individuals, consistent with the approach to other bird species on the IUCN Red List for which no population is known, threats are intense, but hope remains for survival (S. H. M. Butchart *in litt.* 2007). As no population of *G. m. gilesi* is known, this description should not materially affect the IUCN assessment of *G. milleri*.

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The Bartels and other egg collections from the island of Java, Indonesia, with corrections to earlier publications of A. Hoogerwerf

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Summary.—The oology of Java has been described in two longer publications by A. Hoogerwerf (Hoogerwerf 1949a, Hellebrekers & Hoogerwerf 1967). Here I present unequivocal proof that many of the clutches mentioned in those publications, and presented by Hoogerwerf as having been collected by himself, had been stolen by him from other collections, namely those of the Bartels family, of P. J. Bouma, and of my brother R. W. Becking and myself. Hoogerwerf doubtless accessed all three collections while unofficially employed at the Bogor Zoological Museum during and immediately after the Second World War. To conceal what he had done Hoogerwerf also falsified associated collecting data. One can only conclude that information on the oology of Java published by A. Hoogerwerf, or included in his collection now at the RMNH in Leiden, is untrustworthy. Furthermore the value of especially the Bartels egg collection is much greater than even experts think. I do not believe that M. P. J. Hellebrekers was in any way aware of what his co-author Hoogerwerf had done. A request by me 40 years ago to have this information published was refused by the editorial board of the journal concerned, who considered the subject too sensitive.

'Al is de leugen nog zo snel, de waarheid achterhaalt haar wel.' (Dutch proverb)
[No matter how fast the lie, the truth will catch up with it.]

Following the Second World War, two publications appeared by A. Hoogerwerf about the birds of Java and their eggs. The first, Hoogerwerf (1949a), was largely prepared while he worked at the Bogor Zoological Museum as a guest and refugee-in-hiding during the Japanese occupation of Java, and while he worked at the nearby Department of Forestry as Nature Conservation Officer after the war. Almost 20 years later, back in The Netherlands, Hoogerwerf published a follow-up (Hellebrekers & Hoogerwerf 1967). Therein, Hellebrekers described the Bartels egg collection, by then held in the Rijks Museum voor Natuurlijke Historie in Leiden (hereafter RMNH), whilst Hoogerwerf described his own egg collection, which went to RMNH shortly after his death in February 1977. In both publications Hoogerwerf stated explicitly that all the egg material mentioned by him, if not otherwise indicated, was from his own collection, taken mainly in West Java (Hoogerwerf 1949a: 1, Hellebrekers & Hoogerwerf 1967: 3).

As a former co-worker of the Bartels family, I possess much material such as collecting notes and very detailed lists of the Bartels egg collection, which I studied prior to the onset of war in the Pacific in December 1941. My aim here is to show that a very important part of Hoogerwerf's descriptions and colour plates of eggs were derived from the collections of others, especially the Bartels'. Moreover, Hoogerwerf apparently removed many eggs from the Bartels collection, especially those of rare species, and incorporated them into his own. He did this while the Bartels collection was at the Bogor museum during the Japanese occupation. Hoogerwerf demonstrably also made unauthorised use of other egg collections present in the Bogor museum. To hide these facts Hoogerwerf gave the eggs he appropriated new numbers and false dates and localities, for which he often simply inserted the place where he used to live, i.e. the lower slopes of Mt. Salak near Bogor. These incorrect dates and localities were subsequently published in Hoogerwerf (1949a) and Hellebrekers & Hoogerwerf (1967).

Following publication of the latter, I wrote an article in English, similar to the present one, and submitted it to a Dutch ornithological journal. In the covering letter I suggested that Hoogerwerf be permitted to see my comments and respond publicly. The initial written reaction from the editorial board, dated 2 October 1969, assured me of publication, although the procedure would be long. It was agreed that Hoogerwerf should be asked to respond within three months, in English. However, it took him six months and he wrote it in Dutch, making it unpublishable in the journal concerned, as Hoogerwerf would have known. In addition, it was more than three times the length of my own manuscript (52 single-spaced pages). I was not allowed to see it by Hoogerwerf, but I obtained it very much later from the editors. I could only agree that it was indeed unpublishable, and not only because it was written in Dutch.

The editors declined to publish my article for two main reasons. First, to publish both articles (*c.*70 pages) would be too expensive. Second, my article was of a very sensitive nature. Subsequently, I received a personal letter (still in my personal archive) from the main editor, stating that it had been a very difficult decision, as they did not want to appear to take sides. A request of mine to Prof. L. D. Brongersma, Director of RMNH, to appoint an impartial commission to study the disagreement between Hoogerwerf and myself, was unsuccessful. Ernst & Hans Bartels, who had read my manuscript and could confirm some of my statements, wrote to the editor of the Dutch journal concerned on 6 May 1970 (in my archive), stating that the editor could not leave this case unresolved and also asking him to appoint a commission to investigate the problem. They received no reply.

As a close friend of the Bartels family and a co-worker on their collection, I feel I owe it to them to try once more to re-establish the real and enormous value of their egg collection. It is also important to show that information on the oology of Java published by Hoogerwerf, which has found its way into many important ornithological handbooks, is untrustworthy. I therefore describe here the historical context and the original collections involved. I give examples of clutches affected by Hoogerwerf's misdeeds, and discuss the implications for what is known of the oology of Java.

Historical context

After the Japanese attack on Pearl Harbor, the Netherlands followed the USA and declared war on Japan on 8 December 1941. All Dutch men of military age in the Dutch East Indies, trained or not, were called up to serve in the Royal Dutch East Indies Army (KNIL). The ornithologists / biologists Dr M. Bartels Jr., Dr A. C. V. van Bemmel, P. J. Bouma, A. Hoogerwerf, J. G. Kooiman, A. J. R. Lonsain, J. J. Ter Pelkwijk and G. F. H. W. Rengers Hora Siccama were among those drafted. Of these M. Bartels Jr., Bouma, Lonsain, Ter Pelkwijk and Rengers Hora Siccama did not survive the war.

Until he was drafted into the army, Hoogerwerf was employed as Nature Conservation Officer in the Department of Forestry of the Netherlands East Indies. The Department of Forestry was also in Bogor, but organisationally quite separate from the Zoological Museum. Shortly after the unconditional surrender of KNIL to the Japanese army on 8 March 1942, the Japanese placed Prof. T. Nakai, a botanist and plant taxonomist, in charge of both the Royal Bogor Botanical Gardens (Kebun Raya) and the Bogor Zoological Museum (within the gardens). Soon afterwards Hoogerwerf reappeared in Bogor in civilian clothes and offered his services to the Japanese. At Hoogerwerf's own suggestion, Nakai permitted him to work in the Bird Division of the Zoological Museum. There was a supposed vacancy there as its head, Dr van Bemmel, was by then a prisoner of war and had been taken to work in the coal mines in Japan. Hoogerwerf thus never held an official position at the Bogor Zoological Museum, but, like several other Europeans, worked there only on sufferance from its director Lieftinck and from the Japanese while they were in power. When the Dutch temporarily returned to power in Indonesia in 1947, Hoogerwerf returned to his old position as Nature Conservation Officer in the Department of Forestry. He moved between Indonesia and the Netherlands until 1957, when he relocated to Dutch New Guinea and later permanently to the Netherlands (Voous 1995: 278–280).

Because my father was working next door as Head of the Department of Forestry, I had been in and out of the museum since primary school. During the school holidays in 1937, when I was 13, I was taught to prepare bird skins under the tutelage of P. F. Franck, head taxidermist of the Bogor museum. Later, in 1940–41, I was asked by the then director (1931–56) of the museum, M. A. Lieftinck, to collect certain bird species rare or lacking in the collection, using a small rifle. When invasion by the Japanese seemed imminent in December 1941, I was given an unpaid position at the museum, in the hope of safeguarding me as junior civilian from possible internment by the Japanese. I was 17 at the time. This position I held until late August 1945, when I left Indonesia for the University of Leiden.

Before the war, in 1937, I also came to know Max Bartels Jr., and was in close contact with him from 1939 until December 1941. Together we undertook many excursions to Java's montane forests, the lowland forests along the south coast of West Java (Pelabuanratu region), and the cliff islands along this coast. I had free access to his collection to measure bird skins and eggs, and to take notes. He, my brother Rudolf and I conducted a lively, near-weekly correspondence in which we exchanged and shared bird observations and egg acquisition data. Moreover, my brother and I were frequently allowed to study the Bartels collection at his home at Ciparay. I therefore became very familiar with this collection, and measured many of its eggs during this period.

The egg collections involved

During the Pacific War, three private egg collections found refuge at the Bogor Zoological Museum because of war circumstances.

The Bartels collection.—This was started by Max (M. E. G.) Bartels Sr., who was born on 24 February 1871 at Bielefeld, Westphalia, Germany. In 1895, at the age of 24, he came to Java to work as a planter for the agro-industrial company Crone and started collecting already en route from Jakarta to his new post near Surabaya in East Java. The next year, 1896, he moved to Pasir Datar near Sukabumi (West Java), where he was appointed manager of the 'Pangerango' Tea Estate, on the south-west slope of Mt. Pangrango, at *c.*1,000 m. He stayed there for the rest of his working life. Only after retiring in late 1928 did he move to Ciparay, on a nearby ridge, where he died on 7 April 1934.

Max Bartels Sr. married Lien Maurenbrecher, originally an elementary school teacher, but also a gifted painter of natural subjects including birds. They had three sons: Max Bartels Jr. (*b.* 1902), Ernst (*b.* 1904) and Hans (*b.* 1906). All three were keen naturalists and through many expeditions all over Java helped expand the family collections with bird observations and notes, skins, nests and eggs, and sometimes mammal skins. Max Jr.

obtained a Ph.D. in biology from the University of Bern in Switzerland, and in 1931 he returned to Java to work as an independent ornithologist and mammalogist. On his father's death in 1934 Max Jr. assumed curatorship of the family collections, which were housed at his home at Ciparay and which he and his brothers continued to expand.

In December 1941 Max and Hans were drafted into KNIL and soon after the capitulation of the Dutch army they were sent as prisoners of war to work on the notorious Burma railway for the Japanese. Their brother Ernst was imprisoned somewhat later and taken to the Cimahi civilian concentration camp near Bandung. The Bartels collection remained at Ciparay on his explicit wish, as also explained to Lieftinck, who approached Max Jr. about this as soon as war broke out.

In February–March 1944 the attention of the Indonesian police was drawn to zinc-clad containers, so-called 'Cambridge cans', being offered for sale on the black market at Sukabumi. Because the Bartels family had been living very close to Sukabumi for two generations, their collecting activities were well known locally. It was therefore rather easy for the Sukabumi police to trace these containers to the house of Max Jr. at Ciparay, where they had been used for protecting the family's zoological collections. In both the house and the storehouses where the zoological collections were held the police noticed signs of burglary and duly informed the Bogor museum.

Around the same time, in February–March 1944, there had been a military as well as a political change in Indonesia. The tide had turned against the Japanese, their army was on the defensive, even in retreat. To strengthen the army the Japanese authorities promised, and actually proclaimed, the liberation of Indonesia, if the Indonesians were willing to fight with them against the enemy. In this way they were able to recruit Indonesian soldiers and civilian workers for the army in their fight against the Allies (*cf.* de Jong 1985: 515, 912, 932). As part of this political shift, all governmental and administrative functions—thus also the management of the Bogor museum—passed into Indonesian hands.

In reaction to the news from the Sukabumi police, the new museum management decided to evacuate the Bartels collection to Bogor. This was to be supervised by Abdul Samat, then in the museum's service, but previously Max Jr.'s head taxidermist (see Becking 1989: 227). The Indonesians asked Prof. Nakai for military protection to safeguard the expedition, because roads outside the cities were not safe at that time. The collection was transported to the museum in four trips, each accompanied by two Japanese truck drivers and an armed Japanese officer (none of them interested in zoological collections or involved in their packing). When Hoogerwerf heard about this, he offered his help to Abdul Samat. Although Samat initially accepted his help, Hoogerwerf was barred from joining the final two trips, because he was apparently more interested in the papers, manuscripts and notes of the Bartels family than in packing bird skins (A. Samat pers. comm.). Hoogerwerf indeed acknowledged in a letter to Lieftinck, dated 27 February 1954, that he had been barred from joining these two trips (copy of this letter in my possession). Therefore, Hoogerwerf's claim that he rescued the Bartels collection, cited by Voous (1995: 204) and others, is untrue.

Max Bartels Jr. died as prisoner of war of the Japanese in the 'Chung Kai' prisoner camp in Thailand on 6 October 1943. His younger brother Hans, who also worked on the Burma railway but in another camp, survived the war. Their brother Ernst also survived.

In April 1946 the Bartels collection was sent by truck from the Bogor museum to Jakarta and subsequently by boat to the Netherlands, where it arrived at Leiden in September / October 1946. The Bartels collection comprised at that time 14,643 bird skins of Javan birds, more than 4,000 eggs of Javan birds, and more than 500 nests (see documents on the valuation of the collection in June / July 1948 by L. Coomans de Ruiter, lodged at RMNH). The entire collection was sold to RMNH for NLG 77,504 on 25 May 1954, after very protracted (eight years!) negotiations with the remaining two Bartels brothers, primarily Ernst. The Bartels egg collection was officially incorporated into the museum on 1 July 1954, when accession cards were filled out.

In 1969–70, under the curatorship of G. F. Mees, I was permitted to inspect the Bartels collection, its eggs as well as its bird skins.

The Bouma collection.—Around 1937 the P. J. Bouma egg collection from Java had become *de facto* part of the Bartels collection. Bouma was for many years a forest manager in West Java (Sumurkondang and Cileduk) and later Central Java (Gundih or Gundik). Gundih (07°12′S, 110°53′E) was his last posting on Java, and where he undertook most of his collecting. He and Max Bartels Jr. were long-time friends who undertook many excursions together (see, e.g., Bouma 1932, 1934, Bartels 1937, Bartels & Bouma 1937). In 1937, a year before the Forestry Department transferred Bouma from Java to Samarinda in Borneo, he and Max Jr. agreed that Bouma's egg collection from Java should be incorporated into the Bartels collection.

In the year before Bouma's departure and in the three years before the Pacific War started, many of Bouma's eggs were gradually incorporated into the Bartels collection by Max Jr. The clutches were all from Gundih. Examples are eggs of Chestnut-breasted Malkoha *Rhamphococcyx curvirostris*, collected 18 March 1936–8 May 1936, 23 clutches totalling 44 eggs (RMNH 39004–39017, 39021–39029); Green Peafowl *Pavo muticus*, 31 October 1935 (RMNH 29765); Brush Cuckoo *Cacomantis variolosus*, 10 March 1936 (RMNH 388965); Brown Boobook *Ninox scutulata*, 3 May 1936 (RMNH 39070); and Richard's Pipit *Anthus novaeseelandiae*, 27 May 1936 (RMNH 39473).

During the operation to remove the Bartels collection to Bogor in February–March 1944, Hoogerwerf visited the Bartels' house at Ciparay under the supervision of Abdul Samat. Although Hoogerwerf thus knew of the origin of the Bouma collection, in discussing its contents (Hoogerwerf 1949a: 2, 4) he never mentioned that the collection actually came from the private house of Max Bartels Jr. at Ciparay. And, instead of negotiating with the owners of the Bartels collection (the surviving brothers Ernst and Hans), Hoogerwerf only contacted P. J. Bouma's brother, J. P. Bouma, in the Netherlands, who had never been in Indonesia and was unacquainted with the actual situation there. J. P. Bouma was probably not informed by Hoogerwerf about P. J. Bouma's transferral of his egg collection to the Bartels collection before the war. At Hoogerwerf's suggestion, J. P. Bouma thus agreed to donate his brother's egg collection to the Bogor museum, where it came under Hoogerwerf's care and ultimately, in part, into his possession.

Proof of P. J. Bouma's transfer of his egg collection lies in the incorporation of a considerable number of Bouma's eggs into the Bartels collection, species by species, well before Bouma's departure for Borneo and long before World War II (e.g. all of the clutches from Gundih cited above). Complete incorporation could not take place once the war had started, because Max Jr. was by then in the army, from which both he and Bouma did not return. Moreover, Bouma had an extensive collection of over 1,000 Java bird specimens, many prepared by Max Jr.'s staff and originally also stored in the latter's house. This collection Bouma took with him to Borneo in 1938. That he did not also take his egg collection provides further proof that it had been donated to Dr Max Bartels Jr.

In February 1953 Lieftinck asked the German ornithologist J. E. Jany, then working at the Bogor museum, to provide the Bouma collection with labels and to register it on a card index. Jany found that many of Bouma's teakwood trays had empty egg boxes, and Lieftinck wrote to Hoogerwerf for an explanation. Hoogerwerf (then at the Forestry

Department) replied by return (13 March 1953) that the Bouma collection had been like that when he saw it for the first time at Ciparay.

The Becking collection.—This egg collection of Javan birds was started in 1936–37 by my older brother Rudolf W. Becking and myself. It comprised *c.*1,500 clutches by the time the Japanese forces approached Java. In 1938, I also started a small private skin collection, which at the time of the Japanese invasion numbered *c.*150–200 specimens. During the war our egg and bird skin collections were stored at the Bird Division of the Bogor museum, with Dr Lieftinck's consent. The collection was taxonomically arranged and all clutches were in separate boxes. Although, after August 1945, I did not return to Bogor until many years later (between 1971 and 2001 I revisited Indonesia 12 times), my brother, still in Indonesia, reclaimed the collection from the museum in April 1947 and, when he finally received it, noted that many egg boxes had been emptied. This had clearly been done selectively, since it was particularly the boxes with clutches of Accipitridae and Falconidae, of *Pavo muticus* and of many smaller rare species that were empty.

The Hoogerwerf collection.—Finally, there is Hoogerwerf's private egg collection, which he described in Hoogerwerf (1949a) and in Hellebrekers & Hoogerwerf (1967). Following Hoogerwerf's death on 5 February 1977, the collection was donated to RMNH by his widow, and was incorporated into the museum collection on 27 April 1977, when accession cards were completed. The present curator of birds at RMNH, H. van Grouw, kindly allowed me to examine the collection in 2005–07.

Relevant written material

Besides the egg collections, important evidence is provided by documentation of the various collections involved. In addition to Hoogerwerf's oological publications (Hoogerwerf 1949a, 1950a,b, Hellebrekers & Hoogerwerf 1967), I have in my possession the following original manuscripts, or in one case (C) copies of the original writings.

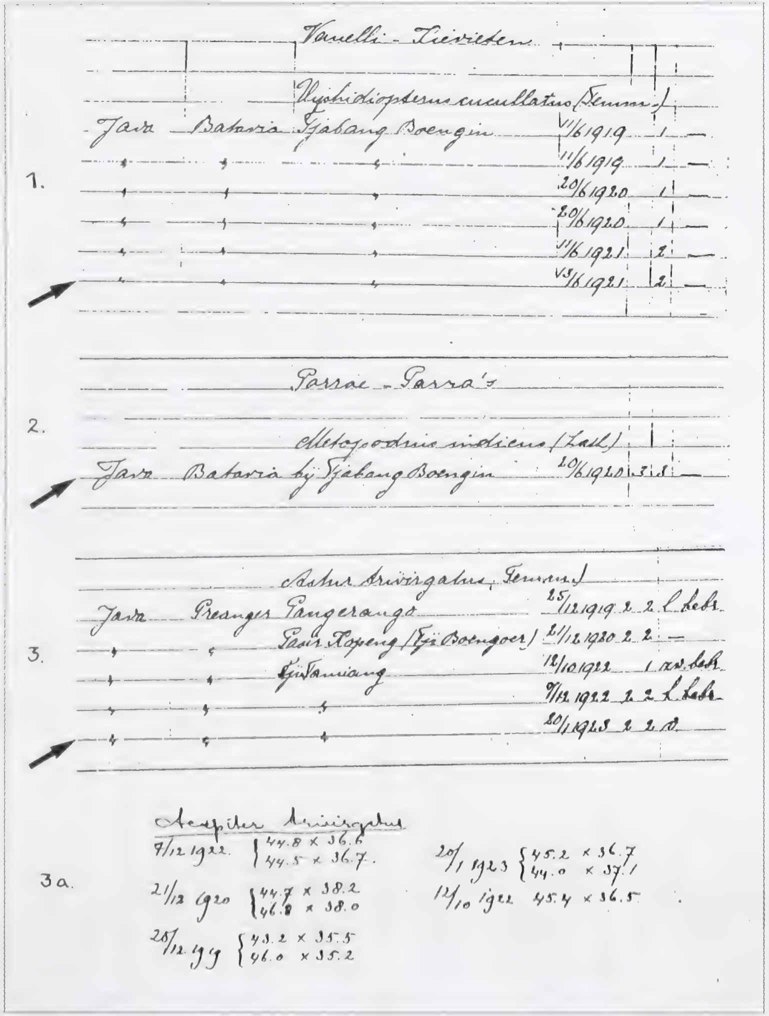
A.—Three handwritten lists of clutches present in the Bartels collection until 1927, written by Hans Bartels. One list is nearly complete, with only a few species lacking. (See Fig. 1, nos. 1–3, Fig. 2, nos. 4–6, Fig. 3, nos. 7–8, Fig. 4, nos. 10, 11, 13–14, Fig. 5, no. 15.)

B.—Two handwritten lists of eggs collected by Hans Bartels during his 'sabbatical year', which his father gave him to observe birds and collect eggs of species not yet present in the Bartels collection (see Becking 2001), before starting planter's training in Deventer, the Netherlands. The two lists cover the periods 1 March 1927–2 September 1927 and 3 September 1927–2 March 1928. (See Fig. 3, no. 9.)

C.—Letters by Hans Bartels at Sukabumi to his brother Max Jr. in Bern, Switzerland, where the latter was studying biology. These letters, dated 10 April 1927 to 2 July 1928, contain much discussion about bird observations and egg acquisitions, including new records for the Bartels collection. (Copies only; the originals are in the K. H. Voous archives in the Artis Library, Amsterdam.) (See Fig. 1, no. 3a, Fig. 2, nos. 4a, 5a, Fig. 3, no. 9a.)

D.—A daily acquisition list of eggs handwritten by Max Bartels Jr., covering the period 6 September 1940–23 May 1941. (See Fig. 4, no. 12, Fig. 5, no. 16.)

E.—A daily acquisition list of eggs (E,a) and notes and notebooks (E,b) handwritten by Max Bartels Jr., covering the period 1932–36. (See Fig. 2, no. 6a, Fig. 3, no. 6b.)



Vanelli - Kievieten

Xiphidiopterus cucullatus (Temm.)

1.
Java Batavia Tjabang Boengin 11/6 1919 1 —
" " " 11/6 1919 1 —
" " " 20/6 1920 1 —
" " " 20/6 1920 1 —
" " " 11/6 1921 2 —
" " " 13/6 1921 2 —

Parrae - Parra's

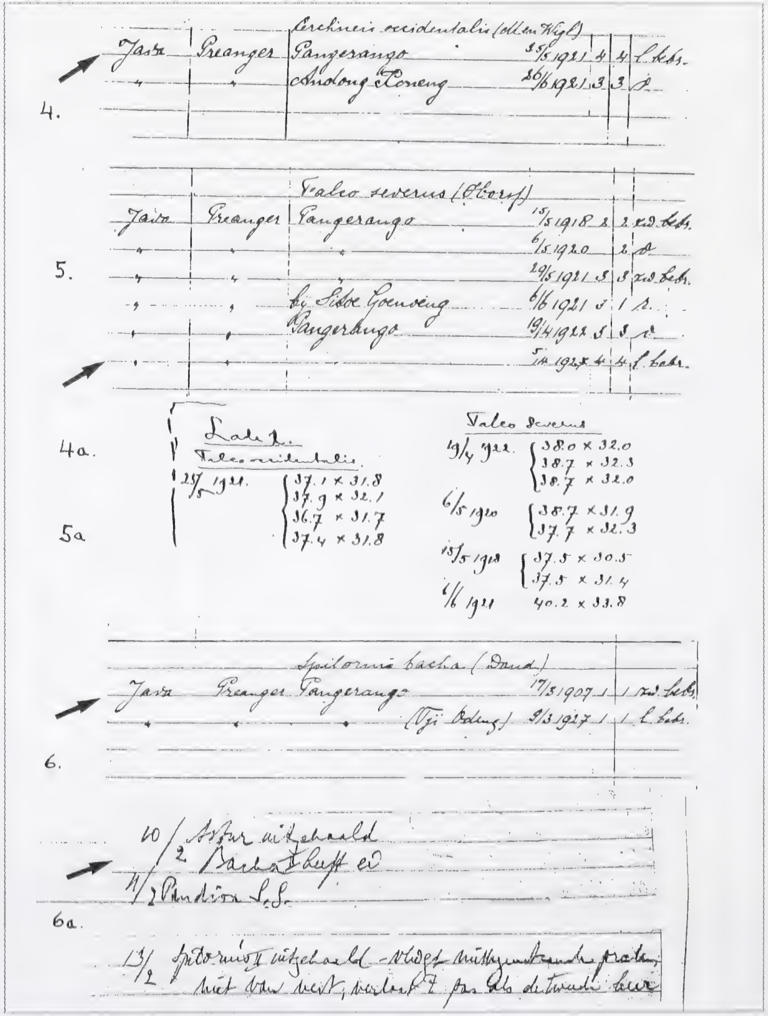
2.
Metopodius indicus (Lath.)
Java Batavia bij Tjabang Boengin 20/6 1920 3 3 —

Astur trivirgatus (Temm.)

3.
Java Preanger Pangerango 25/12 1919 2 2 l. bebr.
" " Pasir Kopeng (Tji Boengoer) 21/12 1920 2 2 —
" " Tjitamiang 12/10 1922 1 zw. bebr.
" " " 7/12 1922 2 2 l. bebr.
" " " 20/1 1923 2 2 id.

3a.
Accipiter trivirgatus
7/12 1922 {44.8 × 36.6
44.5 × 36.7.
21/12 1920 {44.7 × 38.2
46.8 × 38.0
25/12 1919 {43.2 × 35.5
46.0 × 35.2
20/1 1923 {45.2 × 36.7
44.0 × 37.1
12/10 1922 45.4 × 36.5

Figure 1



Cerchneis occidentalis (Bl. en Wagl.)

4.
Java Preanger Pangerango 25/5 1921 4 4 l. bebr.
" " Andong Koneng 26/6 1921 3 3 id.

Falco severus (Horsf.)

5.
Java Preanger Pangerango 15/5 1918 2 2 zw. bebr.
" " " 6/5 1920 2 id.
" " " 29/5 1921 3 3 zw. bebr.
" " bij Sitoe Goenoeng 6/6 1921 3 1 id.
" " Pangerango 19/4 1922 3 3 id.
" " " 5/4 1927 4 4 l. bebr.

4a.
Lab. [illegible]
Falco occidentalis
25/5 1921. {37.1 × 31.8
37.9 × 32.1
36.7 × 31.7
37.4 × 31.8

5a
Falco severus
19/4 1922. {38.0 × 32.0
38.7 × 32.3
38.7 × 32.0
6/5 1920 {38.7 × 31.9
37.7 × 32.3
15/5 1918 {37.5 × 30.5
37.5 × 31.4
6/6 1921 40.2 × 33.8

Spilornis bacha (Daud.)

6.
Java Preanger Pangerango 17/3 1907 1 1 zw. bebr.
" " " (Tji Odeng) 9/3 1927 1 1 l. bebr.

6a.
10/2 Astur uitgehaald
2 Baza [illegible] ed
11/2 Pandion l. l.
13/2 Spilornis II uitgehaald - vliegt [illegible]
niet van nest, [illegible] [illegible] [illegible]

Figure 2

F.—Some of the near-weekly letters by Max Bartels Jr. to my brother Rudolf and myself during 1939–41, mentioning and discussing additions to the collection. Many letters are partially missing or severely damaged by unknown events in August 1945–April 1946 at the Bogor museum. My brother Rudolf saved about ten letters in April 1947 when he retrieved our private collection from Bogor.

G.—Notes and measurements of eggs in the Bartels collection made by me during my stays at Ciparay with Max Bartels Jr. (1939–41).

H.—Notes concerning egg measurements, fresh weights and shell weights of eggs held in the Becking collection. Typescript with some handwriting by my brother and myself, and also by my father, who taught us to work more systematically and to list collection data for each species separately in well-organised separate files. (See Fig. 5, no. 25, Fig. 6, nos. 26–27, Fig. 7, nos. 28–30, Fig. 8, no. 31.)

Examples of removed eggs and altered data

Considerations of space limit me to examples for only 31 species in this paper. Many others could, however, also be cited. Of the examples, 17 concern the Bartels collection, seven the Bouma collection and seven the Becking collection. For each of species nos. 1–18 and for no. 25 I first cite the relevant information about the clutch or clutches concerned, as presented in (*a*) Hoogerwerf (1949a, on Hoogerwerf's own collection), (*b*) Hellebrekers *in* Hellebrekers & Hoogerwerf (1967; on the Bartels collection), and (*c*) Hoogerwerf *in* Hellebrekers & Hoogerwerf (1967; again on Hoogerwerf's own collection). I also mention (*d*) the clutches of each species present in Hoogerwerf's own egg collection as it came to RMNH a few months after his death. Note that in Hellebrekers & Hoogerwerf (1967) Hoogerwerf's remarks about a particular species always directly follow those of Hellebrekers, so the relevant page is given only for Hellebrekers; note also that, for brevity, (*b*) and (*c*) are referred to in the case study headings below simply as Hellebrekers (1967) and Hoogerwerf (1967).

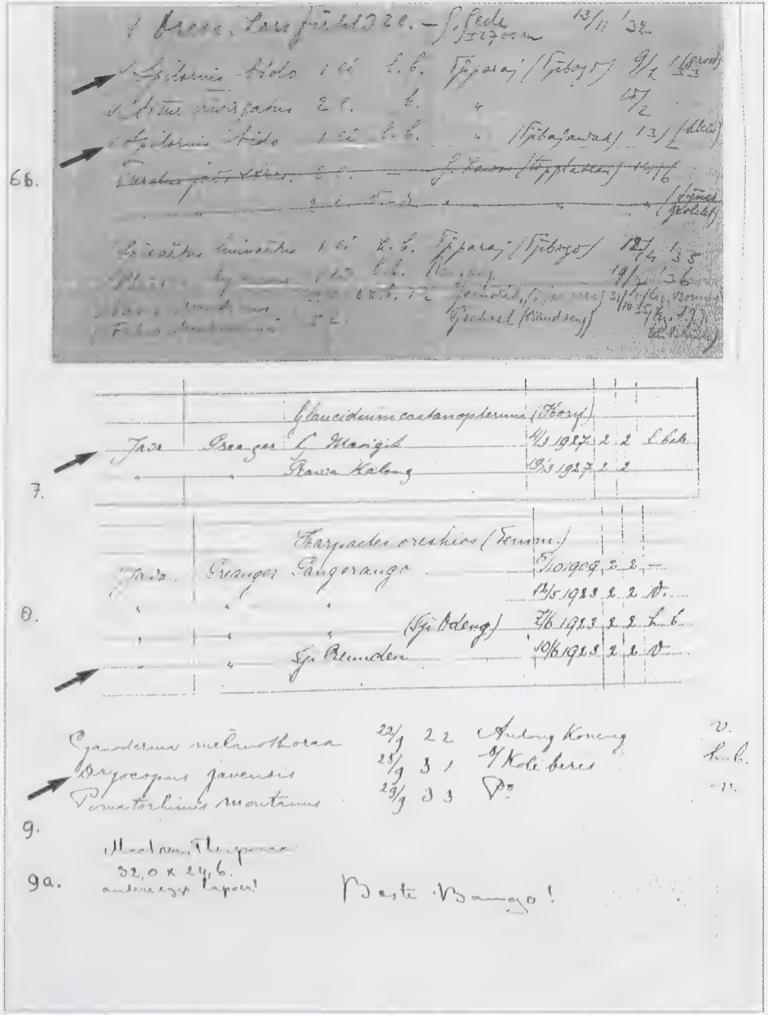
Square brackets [. . .] denote translations; 2/1 means two clutches of one egg, 4/2 means four clutches of two eggs, etc.; the x symbol in Hoogerwerf's tables signifies egg-laying or breeding data not based on clutches present in the collection concerned (see Hoogerwerf 1949a: 5, footnote).

Following these entries, inconsistencies between the four data sources, with other sources and occasionally with other writings of Hoogerwerf, are discussed. An alternative explanation for the origin of the clutches concerned is given and supported with references to the unpublished mss. A–H listed above. Relevant entries in these manuscripts are presented in Figs. 1–8. Where scientific names have changed these are indicated.

Captions to figures on opposite page

Figure 1. Egg collection data in manuscripts of the Bartels family concerning (1) Javan Lapwing *Vanellus macropterus* (= *Xiphidiopterus cucullatus*), (2) Bronze-winged Jacana *Metopidius indicus* and (3 and 3a) Crested Goshawk *Accipiter trivirgatus* (= *Astur trivirgatus*); (1–3) from ms. A, three handwritten lists of clutches present in the Bartels collection until 1927, written by Hans Bartels; (3a) from ms. C, letters by Hans Bartels at Sukabumi to his brother Max Jr. in Bern, Switzerland, dated 10 April 1927–2 July 1928.

Figure 2. Egg collection data in manuscripts of the Bartels family concerning (4 and 4a) Spotted Kestrel *Falco moluccensis* (= *Cerchneis occidentalis* or *F. occidentalis*), (5 and 5a) Oriental Hobby *F. severus* and (6 and 6a) Crested Serpent Eagle *Spilornis cheela* (= *S. bacha*); (4, 5 and 6) from ms. A, three handwritten lists of clutches present in the Bartels collection until 1927, written by Hans Bartels; (4a and 5a) from ms. C, letters by Hans Bartels at Sukabumi to his brother Max Jr. in Bern, Switzerland, dated 10 April 1927–2 July 1928; (6a) from ms. E,a, a daily acquisition list of eggs handwritten by Max Bartels Jr., covering the period 1932–36.



6b.

7\.

		Glaucidium castanopterum (Horsf.)				
Java	Preanger	G. Masigit	4/3 1927	2	2	L.beb.
"	"	Kawa Kalong	13/3 1927	2	2	

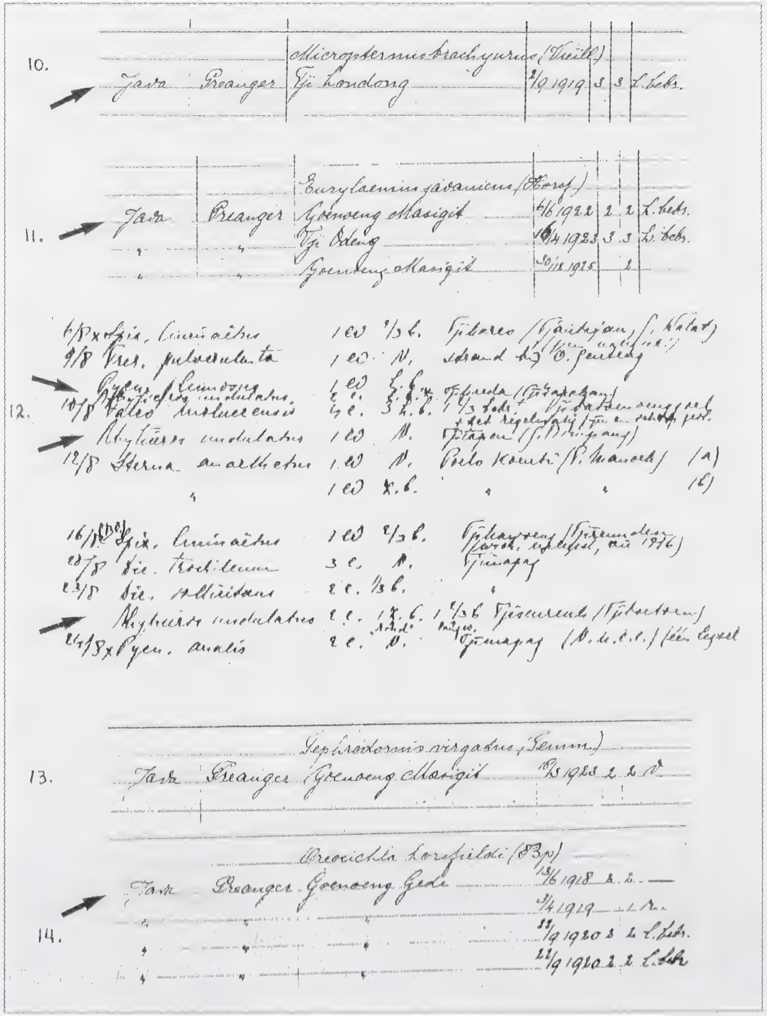
8\.

		Harpactes oreskios (Temm.)				
Java	Preanger	Pangerango	5/10 1909	2	2	—
"	"	"	13/5 1923	2	2	D.
"	"	(Tji Odeng)	7/6 1923	2	2	L.b.
"	"	Tji Beunden	10/6 1923	2	2	D.

9\.

9a.

Figure 3



10\.

		Micropternus brachyurus (Vieill.)				
Java	Preanger	Tji Kondang	2/9 1919	3	3	L.beb.

11\.

		Eurylaemus javanicus (Horsf.)				
Java	Preanger	Goenoeng Masigit	6/6 1922	2	2	L.beb.
"	"	Tji Odeng	16/4 1923	3	3	L.beb.
"	"	Goenoeng Masigit	30/12 1925		2	

12\.

13\.

		Tephrodornis virgatus (Temm.)				
Java	Preanger	Goenoeng Masigit	16/5 1923	2	2	D.

14\.

		Oreocichla horsfieldi (Bp.)				
Java	Preanger	Goenoeng Gede	13/6 1918	2	2	—
"	"	"	3/4 1919		2	D.
"	"	"	11/9 1920	3	2	L.beb.
"	"	"	22/9 1920	2	2	L.beb.

Figure 4

Significance of the egg measurements

Length and width measurements of the same egg may vary due to 'read-off' error, individual measurement error, and operator bias. Acceptable differences in measurements for the same egg by different operators are *c.*1% for egg length, and 1.5–2.0% for egg width (pers. obs.). Of the 21 species mentioned here for which Hoogerwerf and Hellebrekers provide sufficient egg measurements, the average spread in length, i.e. the difference between the shortest and longest egg, is 7.7% (and up to 16%). Fifteen of 21 species show a spread in length of more than 4.9%, five times the measurement error of 1%. The average spread in width is 5.1% (up to 9.0%). Fifteen of 21 species show a spread in length of 3.0% or greater.

Length and width measurements published by Hoogerwerf for eggs of these 15 species are presented below. Hoogerwerf claimed that these eggs were all collected by him. However, the length *and* width measurements of these more than 100 eggs of species with quite variable egg dimensions, can be matched, to within less than the measurement error of 1–2%, with the measurements of eggs missing from collections under Hoogerwerf's care. The measurements match not only egg by egg, but also clutch by clutch. The chances that Hoogerwerf collected precise duplicates for all these eggs and clutches are nil. The only logical conclusion is that Hoogerwerf took these eggs from the collections involved and presented them as collected by himself, which is corroborated by the presence, in Hoogerwerf's collection, of eggs from other collections that are individually identifiable because of their extreme dimensions, unusual markings, the presence of a scar, or the presence on the shell of remnants of lettering from an earlier label.

The Bartels collection

1. **JAVAN LAPWING** *Vanellus macropterus*

(*a*) Hoogerwerf (1949a: 58): [Examined material: three eggs, clutch size four eggs, measurements one egg: 44.30 × 32.90, breeding season May (1), June (x)].

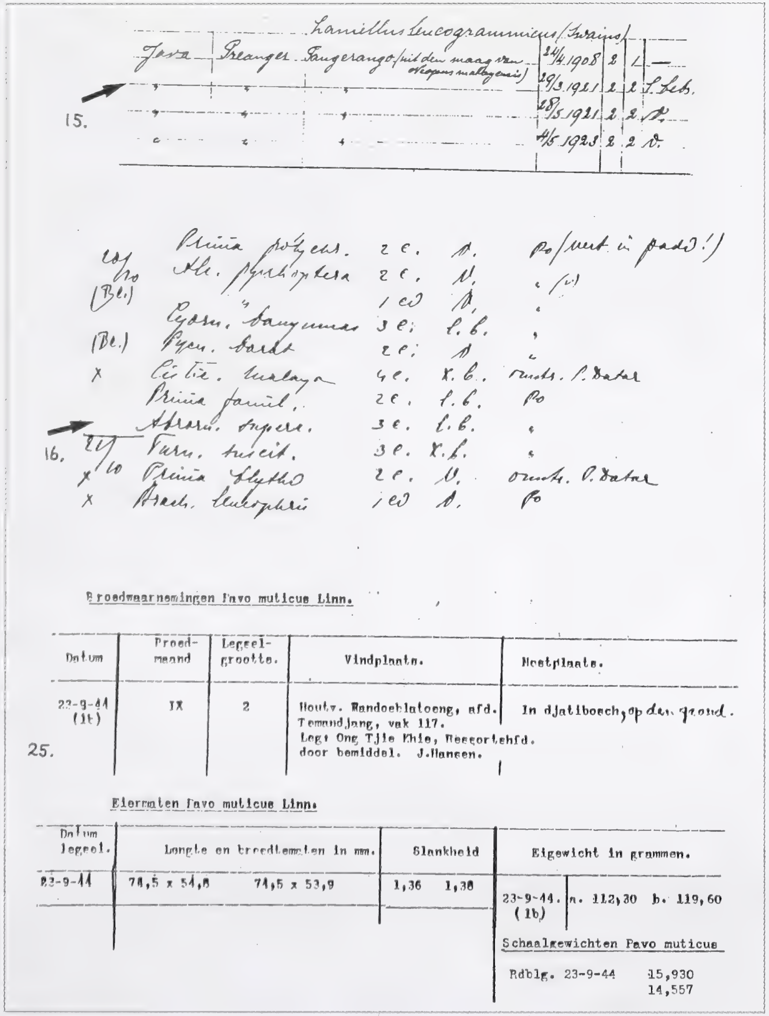
(*b*) Hellebrekers (1967: 34): 'Bartels: 4/1, 1/2, 1/4; May (1), June (5); Rawah Tangerang (1), Cabang Bungin (5), West Java'. Gives measurements and weights of all ten eggs.

(*c*) Hoogerwerf (1967): '1/2; June; Citarum estuary, near Jakarta, West Java. Measurements (2): 47.2 × 30.6, 47.8 × 31.8; weight (1) 1.709. For two previously recorded breeding dates and three earlier measured eggs see Hoogerwerf (1949a: 58–59)'.

Captions to figures on opposite page

Figure 3. Egg collection data in manuscripts of the Bartels family concerning (6b) Crested Serpent Eagle *Spilornis cheela* (= *S. bido*) (see arrows), (7) Javan Owlet *Glaucidium castanopterum*, (8) Orange-breasted Trogon *Harpactes oreskios*, and (9 and 9a) White-bellied Woodpecker *Dryocopus javensis* (= *Thriponax javensis*); (6b) from ms. E, b, notes and notebooks handwritten by Max Bartels Jr., covering the period 1932–36; (7 and 8) from ms. A, three handwritten lists of clutches present in the Bartels collection until 1927, written by Hans Bartels; (9) from ms. B, two handwritten lists of eggs collected by Hans Bartels during his 'sabbatical year', covering the periods 1 March 1927–2 September 1927 and 3 September 1927–2 March 1928; (9a) from ms. C, letters by Hans Bartels at Sukabumi to his brother Max Jr. in Bern, Switzerland, dated 10 April 1927–2 July 1928.

Figure 4. Egg collection data in manuscripts of the Bartels family concerning (10) Rufous Woodpecker *Celeus brachyurus* (= *Micropternus brachyurus*), (11) Banded Broadbill *Eurylaimus javanicus*, (12) Wreathed Hornbill *Rhyticeros undulatus* (see arrows), (13) Large Wood Shrike *Tephrodornis gularis* (= *T. virgatus*) and (14) Scaly Thrush *Zoothera dauma* (= *Oreocichla horsfieldi*); (10, 11, 13 and 14) from ms. A, three handwritten lists of clutches present in the Bartels collection until 1927, written by Hans Bartels; (12) from ms. D, a daily acquisition list of eggs handwritten by Max Bartels Jr., covering the period 6 September 1940–23 May 1941.



Lamillus leucogrammicus (Swains.)

15.

Java	Preanger	Tangerango (uit den maag van Neopus malayensis)	24/4 1908	2	1	—
"	"	"	29/3 1921	2	2	S. Leb.
"	"	"	28/5 1921	2	2	Ar.
"	"	"	4/5 1923	2	2	v.

20/10	Prinia polychr.	2 e.	v.	Po (nest in padi!)
(Bl.)	Alc. pyrrhoptera	2 e.	v.	" (v)
	"	1 ed	v.	"
	Cyorn. banyumas	3 e.	l. b.	"
(Bl.)	Pycn. barb.	2 e.	v.	"
x	Cist. malaya	4 e.	r. b.	rnds. P. Datar
	Prinia famil.	2 e.	l. b.	Po
	Abrorn. superc.	3 e.	l. b.	"
16. 21/10	Turn. suscit.	3 e.	r. b.	"
x	Prinia blythi	2 e.	v.	rnds. P. Datar
x	Brach. leucophris	1 ed	v.	Po

Broedwaarnemingen Pavo muticus Linn.

Datum	Broed-maand	Legsel-grootte.	Vindplaats.	Nestplaats.
23-9-44 (1t)	IX	2	Houtv. Wandoeblatoeng, afd. Temandjang, vak 117. Leg: Ong Tjie Khie, Ressortchfd. door bemiddel. J.Hansen.	In djatibosch, op den grond.

25.

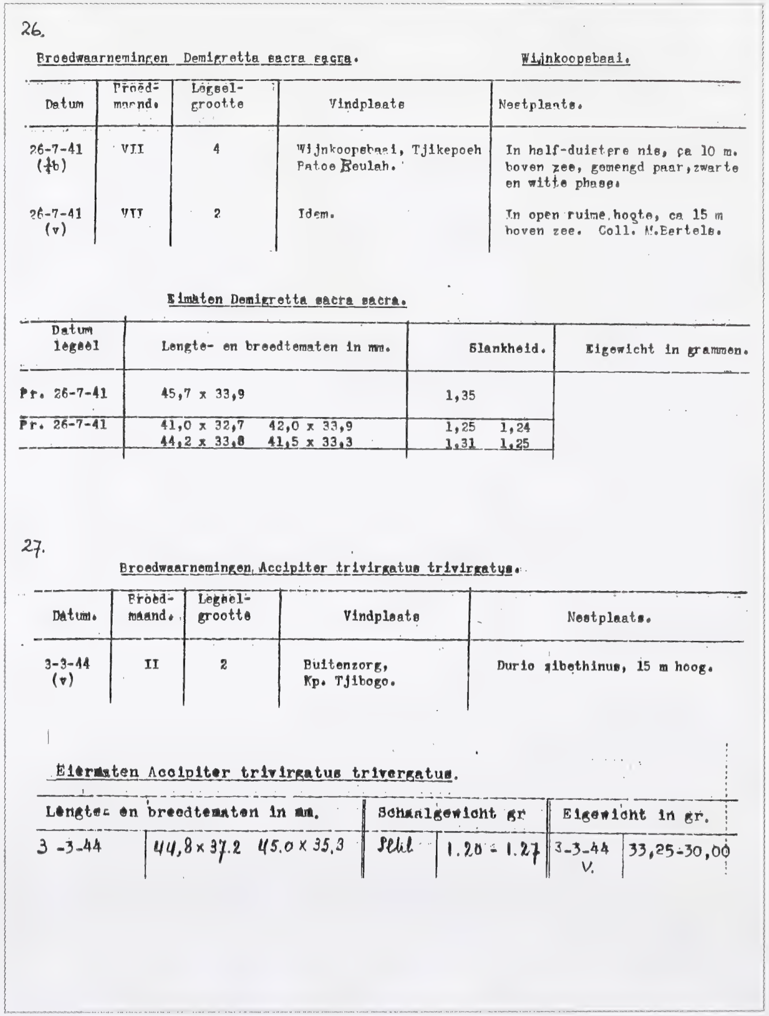
Eiermaten Pavo muticus Linn.

Datum legsel.	Lengte en breedtematen in mm.		Slankheid		Eigewicht in grammen.	
23-9-44	74,5 x 54,8	74,5 x 53,9	1,36	1,38	23-9-44. (1b)	n. 112,30 b. 119,60

Schaalgewichten Pavo muticus

Rdblg. 23-9-44 15,930
14,557

Figure 5



26.

Broedwaarnemingen Demigretta sacra sacra. Wijnkoopsbaai.

Datum	Broed-maand.	Legsel-grootte	Vindplaats	Nestplaats.
26-7-41 (¼b)	VII	4	Wijnkoopsbaai, Tjikepoeh Patoe Beulah.	In half-duistere nis, ca 10 m. boven zee, gemengd paar, zwarte en witte phase.
26-7-41 (v)	VII	2	Idem.	In open ruime hogte, ca 15 m boven zee. Coll. M.Bertels.

Eimaten Demigretta sacra sacra.

Datum legsel	Lengte- en breedtematen in mm.		Slankheid.		Eigewicht in grammen.
Pr. 26-7-41	45,7 x 33,9		1,35		
Pr. 26-7-41	41,0 x 32,7 44,2 x 33,8	42,0 x 33,9 41,5 x 33,3	1,25 1,31	1,24 1,25	

27.

Broedwaarnemingen Accipiter trivirgatus trivirgatus.

Datum.	Broed-maand.	Legsel-grootte	Vindplaats	Nestplaats.
3-3-44 (v)	II	2	Buitenzorg, Kp. Tjibogo.	Durio zibethinus, 15 m hoog.

Eiermaten Accipiter trivirgatus trivergatus.

Lengte- en breedtematen in mm.			Schaalgewicht gr		Eigewicht in gr.	
3-3-44	44,8 x 37.2	45.0 x 35.3	Pehl	1.20 - 1.27	3-3-44 V.	33,25-30,00

Figure 6

(*d*) Hoogerwerf private collection: two clutches: 1/2 '13.06.1940, Citarum delta, W. Java' (RMNH 75549) and 1/1 'c.1940, Citarum delta, W. Java', with no further particulars (RMNH 75548).

Hoogerwerf (1949a) gave little information for the three eggs in his collection. In Hellebrekers & Hoogerwerf (1967) he gave a locality for the collection of one two-egg clutch, but only a collection month, no precise date. In his own collection, at his death ten years later, there were two clutches, 1/2 and 1/1, of this endemic and then probably already extinct species, with a precise collection date for one, but only an approximate year for the other. Hoogerwerf gave no indication that these clutches were not taken by him, yet the collection information is very limited. All this casts doubt on the true origin of these eggs.

That the *V. macropterus* eggs in his collection were not collected by Hoogerwerf also seems probable from a statement by Hoogerwerf in a manuscript entitled 'Birds of Java', updated by him as late as April 1965 and given by his widow to the Zoological Museum in Amsterdam through Dr P. J. H. van Bree, then secretary of the Van Tienhoven Foundation (by which Hoogerwerf had occasionally been employed). On p. 86 Hoogerwerf wrote of *V. macropterus*: 'We have never observed this species in nature'. In addition Hoogerwerf (1949a) stated that the clutch size is four, but did not indicate that this knowledge came from a collection other than his own. He wrote this after having had access to the Bartels collection during the war, which collection contains the only four-egg clutch of the Javan Lapwing in the world.

Furthermore, a photostat of the clutches in Hans Bartels' handwritten list of acquisitions up until 1927, ms. A, is presented in Fig. 1, no. 1, under the name *Xiphidiopterus cucullatus*. Six clutches have been entered, 4/1 and 2/2. When this is compared with the clutches listed for the Bartels collection by Hellebrekers, 4/1 and 1/2, it is clear that one two-egg clutch of the Bartels collection was missing by 1967. The measurements I made of one of the two-egg clutches at the home of Max Bartels Jr. before World War II, labelled '13/6 1921 Batavia, Tjabang Boengin', are 47.8 × 32.0 and 47.4 × 30.8 mm (ms. G). These measurements are, within an error of 0.1–0.2 mm, identical to those for the clutch under RMNH 75549 in Hoogerwerf's private collection: 47.8 × 31.8 and 47.2 × 30.6 mm.

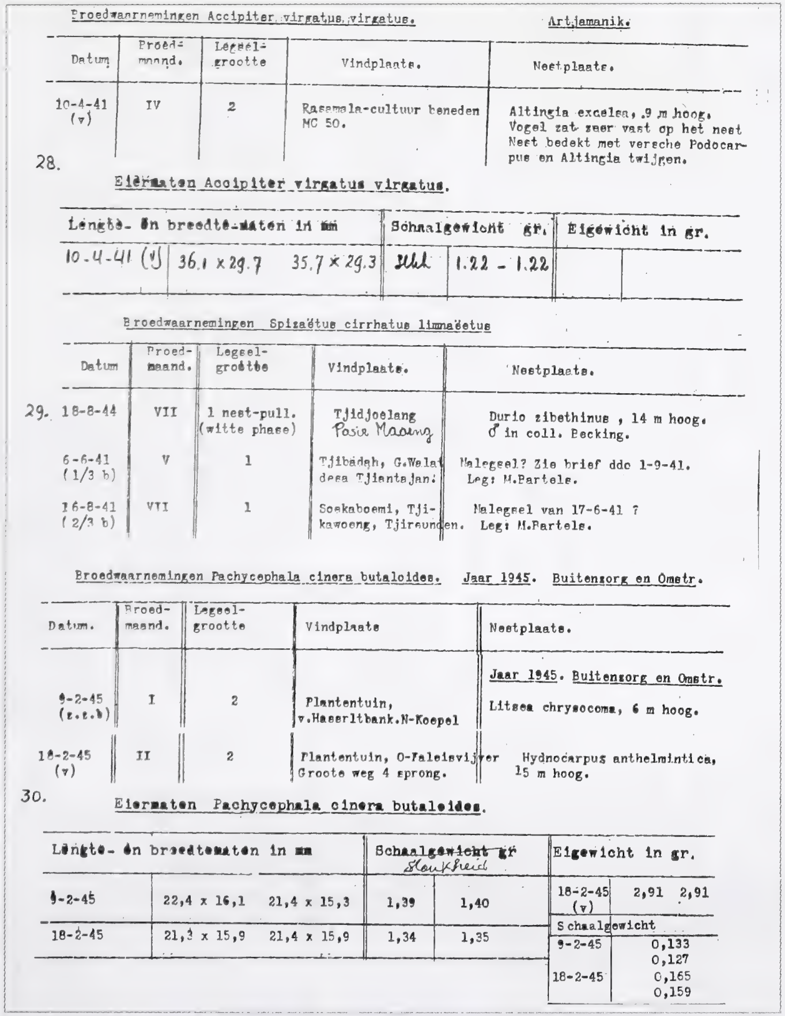
Given the above, one can only conclude that the missing clutch from the Bartels collection and the two-egg clutch in Hoogerwerf's private collection are the same. For this clutch Hoogerwerf gave as collection date '13 June 1940', whilst for the Bartels clutch it was '13 June 1921': Hoogerwerf did not alter the day of collection, but he made a very substantial 19-year change to the year.

The other *V. macropterus* egg in the Hoogerwerf collection (Hoogerwerf 1967, clutch 1/1), stated by Hoogerwerf to have been collected around 1940, is quite likely also originally from the Bartels collection. Like the four-egg clutch, this clutch was not yet included in Hans Bartels' list (ms. A) shown in Fig. 1, no. 1. Its measurements, 44.3 × 32.9 mm, coincide

Captions to figures on opposite page

Figure 5. Egg collection data in manuscripts of the Bartels and Becking families concerning (15) Spotted Crocias *Crocias albonotatus* (=*Laniellus leucogrammicus*), (16) Yellow-bellied Warbler *Abroscopus superciliaris* (see arrow) and (25) Green Peacock *Pavo muticus*; (15) from ms. A, three handwritten lists of clutches present in the Bartels collection until 1927, written by Hans Bartels; (16) from ms. D, a daily acquisition list of eggs handwritten by Max Bartels Jr., covering the period 6 September 1940–23 May 1941; (25) from ms. H, notes concerning egg measurements, fresh weights and shell weights of eggs held in the Becking collection, by my brother R. W. Becking and myself, and by our father J.-H. Becking Sr.

Figure 6. Egg collection data in manuscripts of the Becking family concerning (26) Reef Egret *Egretta sacra* (= *Demigretta sacra*) and (27) Crested Goshawk *Accipiter trivirgatus*; both from ms. H, notes concerning egg measurements, fresh weights and shell weights of eggs held in the Becking collection, by my brother R. W. Becking and myself, and by our father J.-H. Becking Sr.



Proedwaarnemingen Accipiter virgatus virgatus. Artjamanik.

Datum	Proed-maand.	Legeel-grootte	Vindplaate.	Neetplaate.
10-4-41 (v)	IV	2	Rasamala-cultuur beneden MC 50.	Altingia excelsa, 9 m hoog. Vogel zat zeer vast op het nest Nest bedekt met versche Podocarpus en Altingia twijgen.

28.

Eiermaten Accipiter virgatus virgatus.

Lengtè- èn breedtè-maten in mm			Schaalgewicht gr.		Eigewicht in gr.	
10-4-41 (v)	36.1 x 29.7	35.7 x 29.3	ull	1.22 - 1.22		

Broedwaarnemingen Spizaëtus cirrhatus limnaëetus

Datum	Proed-maand.	Legeel-grootte	Vindplaats.	Nestplaats.
29. 18-8-44	VII	1 nest-pull. (witte phase)	Tjidjoelang Pasir Maoeng	Durio zibethinus , 14 m hoog. ♂ in coll. Becking.
6-6-41 (1/3 b)	V	1	Tjibadah, G.Welat desa Tjiantajan.	Malegeel? Zie brief ddo 1-9-41. Leg: M.Partels.
16-8-41 (2/3 b)	VII	1	Soekaboemi, Tjikawoeng, Tjireunden.	Malegeel van 17-6-41 ? Leg: M.Partels.

Broedwaarnemingen Pachycephala cinera butaloides. Jaar 1945. Buitenzorg en Omstr.

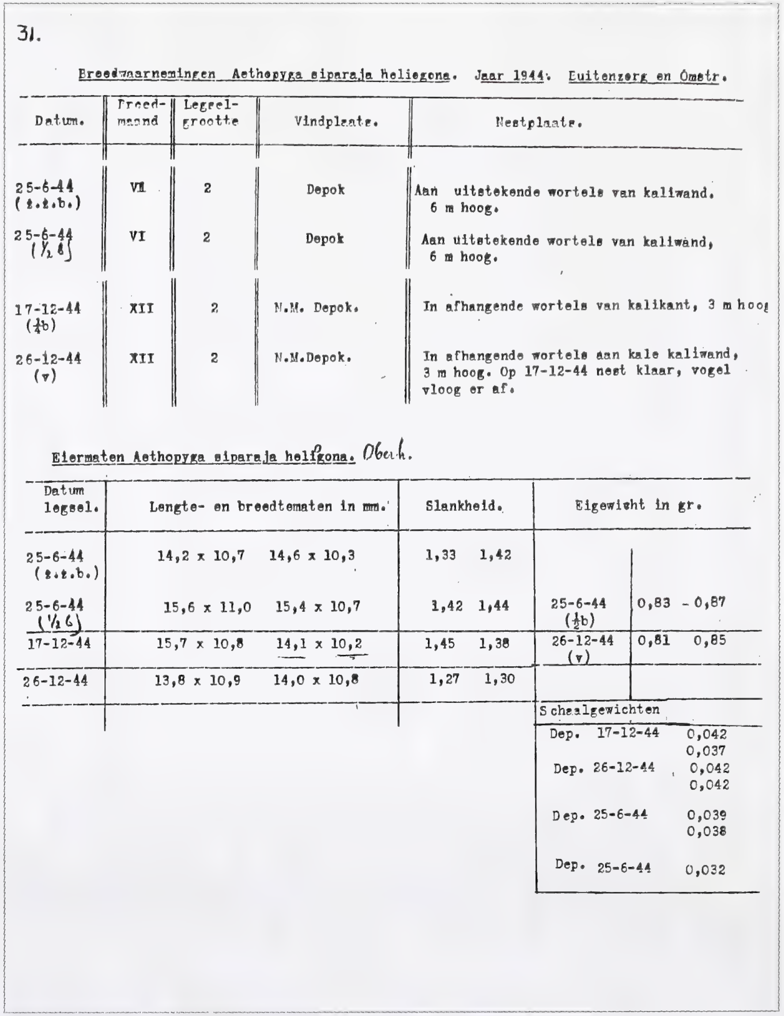
Datum.	Broed-maand.	Legeel-grootte	Vindplaate	Neetplaate.
9-2-45 (z.z.b)	I	2	Plantentuin, v.Haserltbank.N-Koepel	Jaar 1945. Buitenzorg en Omstr. Litsea chrysocoma, 6 m hoog.
18-2-45 (v)	II	2	Plantentuin, O-Faleisvijver Groote weg 4 sprong.	Hydnocarpus anthelmintica, 15 m hoog.

30.

Eiermaten Pachycephala cinera butaloides.

Lèngte- èn breedtematen in mm			Schaal~~gewicht gr~~ Slankheid		Eigewicht in gr.		
9-2-45	22,4 x 16,1	21,4 x 15,3	1,39	1,40	18-2-45 (v)	2,91	2,91
18-2-45	21,3 x 15,9	21,4 x 15,9	1,34	1,35	Schaalgewicht		
					9-2-45	0,133 0,127	
					18-2-45	0,165 0,159	

Figure 7



31.

Broedwaarnemingen Aethopyga siparaja heliogona. Jaar 1944. Buitenzorg en Omstr.

Datum.	Proed-maand	Legeel-grootte	Vindplaats.	Neetplaats.
25-6-44 (z.z.b.)	VI	2	Depok	Aan uitstekende wortels van kaliwand. 6 m hoog.
25-6-44 (½ b)	VI	2	Depok	Aan uitstekende wortels van kaliwand, 6 m hoog.
17-12-44 (¼b)	XII	2	N.M. Depok.	In afhangende wortels van kalikant, 3 m hoog
26-12-44 (v)	XII	2	N.M.Depok.	In afhangende wortels aan kale kaliwand, 3 m hoog. Op 17-12-44 nest klaar, vogel vloog er af.

Eiermaten Aethopyga siparaja heliogona. Oberh.

Datum legsel.	Lengte- en breedtematen in mm.		Slankheid.		Eigewicht in gr.		
25-6-44 (z.z.b.)	14,2 x 10,7	14,6 x 10,3	1,33	1,42			
25-6-44 (½ b)	15,6 x 11,0	15,4 x 10,7	1,42	1,44	25-6-44 (½b)	0,83	- 0,87
17-12-44	15,7 x 10,8	14,1 x 10,2	1,45	1,38	26-12-44 (v)	0,81	0,85
26-12-44	13,8 x 10,9	14,0 x 10,8	1,27	1,30			
					Schaalgewichten		
					Dep. 17-12-44	0,042 0,037	
					Dep. 26-12-44	0,042 0,042	
					Dep. 25-6-44	0,039 0,038	
					Dep. 25-6-44	0,032	

Figure 8

with those of a *V. macropterus* egg collected no later than 1925 at an untraceable locality and measured by me before the war as 44.3 × 33.0 mm (ms. G).

The original Bartels collection is thus in effect the only collection to contain eggs of Javan Lapwing; eight clutches in total (5/1, 2/2, 1/4). Hoogerwerf's dates and locations for eggs of this species are false. To my knowledge the four-egg clutch collected by the Bartels family, labelled '12.05.1925, Rawah Tangerang, W. Java' (*cf.* also Collar *et al.* 2000) is the last clutch of this species collected by the Bartels family. Cabang Bungin (six clutches) and Rawah Tangerang (one), just east and west of present-day Jakarta, are the only known collecting localities for clutches of Javan Lapwing. The eighth clutch is probably also from either of these localities. Information to the contrary, in e.g. Collar *et al.* (2001: 1383), based on Hoogerwerf (1949a) and Hellebrekers & Hoogerwerf (1967), is incorrect.

2. **BRONZE-WINGED JACANA** *Metopidius indicus*

(*a*) Hoogerwerf (1949a: 56–57, Plate V, Fig. 43): [Examined material: seven eggs (two clutches), clutch size 3–4 eggs, no particulars on locality or collecting date, but only Central Java: April (1) and East Java: November (1)].

(*b*) Hellebrekers (1967: 33): 'Bartels: No material available'.

(*c*) Hoogerwerf (1967): '1/3; June; West Java. Measurements (3): av. 34.43 (34–34.9) × 25.3 (25.1–25.5); largest egg: 34.9 × 25.1. Weight (1/3): av. 0.729 (0.717–0.741). For two previously recorded breeding dates and seven earlier measured eggs see Hoogerwerf (1949a: 56–57, Plate V, Fig. 43)'.

(*d*) Hoogerwerf private collection: one clutch, with the label: '1/3, Tangerang W. Java, June 1936' (RMNH 75546).

Hoogerwerf (1949a) gave only very general information for the two clutches of this species, mentioning Central and East Java but no precise localities, and April and November but no precise dates, and no collectors. In 1967 he mentioned only one clutch for his own collection, this time from 'West Java'. This was probably the same clutch present in his collection when the latter was transferred to RMNH. There are marked and unexplained differences between Hoogerwerf (1949a) as opposed to the data in Hellebrekers & Hoogerwerf (1967) and Hoogerwerf's private collection.

A photostat of Hans Bartels' handwritten list of acquisitions until 1927 (ms. A) is presented in Fig. 1, no. 2. Bartels' notation '3,3' means a three-egg clutch (1/3) of which all three are present in the collection. This clutch was no longer present in the Bartels collection when Hellebrekers described it in 1967. My own measurements were 35.0 × 25.3, 34.6 × 25.5 and 34.1 × 25.5 mm (ms. G). This can be summarised as average 34.6 × 25.4 mm vs. Hoogerwerf's 34.4 × 25.3 mm; range in length 34.1–35.0 mm vs. Hoogerwerf's 34.0–34.9 mm; range in width 25.3–25.5 mm vs. Hoogerwerf's 25.1–25.5. mm; and in the Bartels clutch as in Hoogerwerf's, the egg with the greatest length had the narrowest width (35.0 × 25.3 mm vs. 34.9 × 25.1 mm). Given the lack of consistency in Hoogerwerf's own data, the identical measurements (within measurement error), and the access that Hoogerwerf had to the

Captions to figures on opposite page

Figure 7. Egg collection data in manuscripts of the Becking family concerning (28) Besra *Accipiter virgatus*, (29) Changeable Hawk-Eagle *Spizaetus cirrhatus* and (30) Mangrove Whistler *Pachycephala grisola* (= *P. cinerea*); all three from ms. H, notes concerning egg measurements, fresh weights and shell weights of eggs held in the Becking collection, by my brother R. W. Becking and myself, and by our father J.-H. Becking Sr.

Figure 8. Egg collection data in manuscripts of the Becking family concerning (31) Crimson Sunbird *Aethopyga siparaja*; from ms. H, notes concerning egg measurements, fresh weights and shell weights of eggs held in the Becking collection, by my brother R. W. Becking and myself, and by our father J.-H. Becking Sr.

Bartels collection during 1944–45, clutch RMNH 75546 of *Metopidius indicus* must be that missing from the Bartels collection, for which the data are 'Batavia near Tjabang Boengin, 20 June 1920' (Fig. 1, no. 2).

3. **CRESTED GOSHAWK** *Accipiter trivirgatus*

(*a*) Hoogerwerf (1949a: 28) [Examined material: eight eggs (four clutches). Clutch size two eggs, sometimes three. Eggs average 44.91 × 35.88 mm. Breeding months: Jan. (x), Feb. (1), Mar. (1), Dec. (1)].

(*b*) Hellebrekers (1967: 18): 'Bartels: 3/1, 5/2; Febr. (1), Apr. (2), Oct. (1), Dec. (3); W. Java. Measurements (13): av. 45.1 (42.1–49.4) × 36.4 (35.1–38.2). Weight (13): av. 2.40 (2.20–2.80)'.

(*c*) Hoogerwerf (1967): '1/2, without further particulars. Measurements (2): 44.8 × 35.44.6 × 37 [evidently a printing error]: Weight (2/2, 1/3): av. 2.460 (2.290–2.883)'.

(*d*) Hoogerwerf private collection: two clutches (2/2). One labelled in Hoogerwerf's handwriting '2 eggs, 5 Febr. 1939, Buitenzorg (= Bogor), W. Java . leg. A. Hoogerwerf', but with this clutch there is a smaller label 'Tjiawi-Poentjak, Buitenzorg' (RMNH 75484); the other without any data (RMNH 75483).

In Hans Bartels' list of eggs from 1927 (ms. A; *cf.* Fig. 1 no. 3, *Astur trivirgatus*), and in his egg measurements from 1927 (ms. C; *cf.* Fig. 1, no. 3a, *Accipiter trivirgatus*), five clutches for this species are mentioned, 1/1 and 4/2. The clutch '1/2, 20 January 1923, Tji Tamiang' is, however, missing from the Bartels collection in RMNH. The egg measurements were 45.2 × 36.7 and 44.0 × 37.1 mm.

Hoogerwerf *in* Hellebrekers & Hoogerwerf (1967) mentioned for his private collection only one clutch '1/2, without further particulars', while in his collection as given to RMNH two clutches were present. For the clutch without particulars the measurements presented are also confused (see above).

The 1/2 clutch (RMNH 75484) in Hoogerwerf's collection is not mentioned in any of his publications, although collection data are given on the label. The other clutch '1/2, without further particulars' (RMNH 75483) I measured as 45.2 × 36.7 and 44.0 × 37.1 mm, identical to the missing clutch from the Bartels collection, which I measured before the war (ms. G). Moreover, these measurements are identical to those made by Hans Bartels in 1927 in his handwriting (ms. C; *cf.* Fig. 1, no. 3a). This is the clutch '1/2, 20 January 1923, Tji Tamiang' in the original Bartels collection.

Finally, it is remarkable that Hoogerwerf (1949a), based on his private collection, mentioned 'clutch size 2 or 3 eggs and 8 eggs, 4 clutches' when these number three clutches and seven eggs. Later (1967) he also gave the *weights* of these seven eggs (2/2, 1/3): 'Weight (2/2, 1/3): av. 2.460 (2.290–2.883)', as if they were all in his collection. But, at his death, his collection only contained the 2/2 clutches.

4. **SPOTTED KESTREL** *Falco moluccensis*

(*a*) Hoogerwerf (1949a: 39, Plate III, Fig. 25: [Examined material: five eggs (two clutches); clutch size: four eggs. Egg measurements average 37.56 × 31.82 mm. Breeding months: W. Java, Mar. (1), E. Java Mar. (1)].

(*b*) Hellebrekers (1967: 23): 'Bartels: 1/3, 1/4; June, October; West Java. Measurements (7): av. 38.7 (36.9–40.7) × 32.1 (31.3–33.7). Weight 1.65 (1.57–1.71)'.

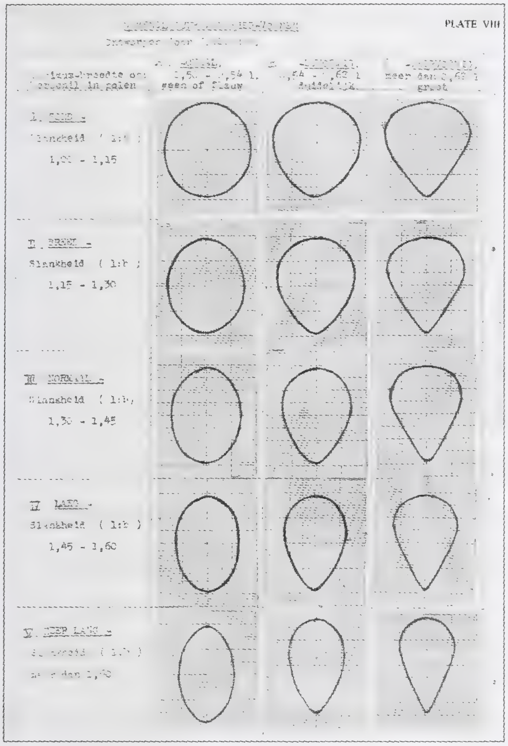


Figure 9

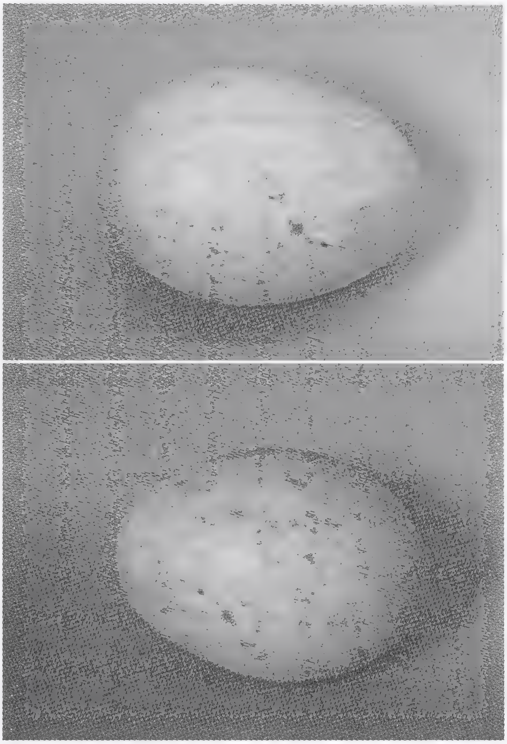


Figure 10

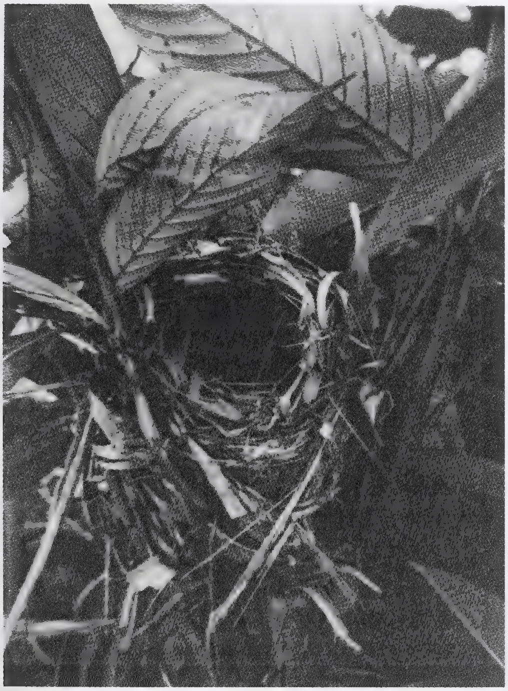


Figure 11

Figure 9. Egg shape nomenclature originated by J.-H. Becking before World War II, but used by Hoogerwerf without acknowledgement in Hoogerwerf (1949a). For more details see the main text.

Figure 10. Egg of Green Peafowl *Pavo muticus* (RMNH 75515) originally from the Becking collection, but which arrived at RMNH via Hoogerwerf's private collection, wherein it was labelled: 'W. Java, without date'. This egg can be individually recognised by its natural scar (top) and remnants of the original lettering of the label with red ink on the shell just above the centre of the egg (bottom), and an artificial pink wash over its surface. It was actually collected in Central Java; for further details see the text. (Jan-Hendrik Becking)

Figure 11. Nest of Mountain Tailorbird *Orthotomus cucullatus* exclusively composed of dry rattan leaves, placed in the fork of a small subcanopy tree, 1 m above ground, at Lake Situ Lembang (2,500 m), above Bandung, West Java, 21 July 1940; the nest contained two fresh eggs (H. La Bastide)

(*c*) Hoogerwerf (1976): 'Weight (1/4): av. 1.614 (1.551–1.675). For seven previously recorded breeding dates and five earlier measured eggs see Hoogerwerf (1949a: 39, Plate III, Fig. 25).'

(*d*) Hoogerwerf private collection: one clutch (1/4), labelled in his handwriting 'Surabaja, Java, 1937, leg. A. Hoogerwerf' (RMNH 75497).

In Hans Bartels' handwritten list of acquisitions to 1927 (ms. A; *cf.* Fig. 2, no. 4), we find *Falco occidentalis*: [(1/4) Pangrango, dated 25 May 1921, slightly incubated.]. This clutch, collected in May, is missing from the Bartels collection as described by Hellebrekers, who lists June and October as months for the two clutches present. The measurements of this clutch taken by Hans Bartels in 1927 (ms. C)—37.1 × 31.8, 37.9 × 32.1, 36.7 × 31.7 and 37.4 × 31.8 mm (*cf.* Fig. 2, no. 4a)—are identical to those of the clutch in Hoogerwerf's collection, which I measured as 37.0 × 31.7, 37.9 × 32.1, 36.9 × 31.7 and 37.5 × 31.8 mm.

Once again, all evidence points to the clutch of *F. moluccensis* in the Hoogerwerf collection belonging to the Bartels collection. It was collected not 'May, 1937 at Surabaya, Java, leg. A. Hoogerwerf', but '25 May 1921 at Mt Pangrango (Pasir Datar), leg. Bartels'. Because the clutch appears as the 'E. Java, May clutch' in Hoogerwerf's collection and publications, this not only represents a change of ownership and date but also a transfer of locality to a completely different part of Java, *c.*700 km away.

A third clutch collected by the Bartels family is (1/4) from Tjoekoel (= Cukul), near Bandung, on 18 October 1929 (ms. E,a). It is also referred to in Max Bartels Jr.'s handwritten notebook (ms. E,b; *cf.* Fig. 3, no. 6b, last entry). This clutch is still present in the Bartels collection (RMNH 38864) and measures 37.1 × 33.7, 37.4 × 33.7, 38.7 × 32.0 and 40.2 × 32.1 mm. A fourth clutch (1/4, slightly incubated) was collected on 10 August 1941 at Tjibatununggul, West Java, by Max Bartels Jr. (ms. D), but is now missing from the Bartels collection, its fate unknown.

5. **ORIENTAL HOBBY** *Falco severus*

(*a*) Hoogerwerf (1949a: 38): [Examined material: five eggs (two clutches). Clutch size: four eggs. Egg measurements average 37.16 × 32.08 mm, length variation: 35.0–40.0 mm, breadth variation: 30.80–33.70 mm, longest egg 40.0 × 33.70 mm, broadest egg 40.0 × 33.70 mm. Both clutches were found in June in West Java.]

(*b*) Hellebrekers (1967: 23): 'Bartels: 4/2, 1/3; April (2), May (3); West Java. Measurements (11): av. 38.9 (37.5–40.5) × 32 (31.4–32.3). Weight (11): av. 1.66 (1.60–1.77)'.

(*c*) Hoogerwerf (1967): 'Weight (1/4): av. 1.370 (1.339–1.417). For one previously recorded breeding date and five earlier measured eggs see Hoogerwerf (1949: 38–39)'.

(*d*) Hoogerwerf private collection: one four-egg clutch lacking locality and date (RMNH 75496).

Again, the lack of collection information accompanying the clutch in Hoogerwerf's collection (1949a), and in his 1967 description of that collection, is remarkable. His collection received by RMNH did not give information on date and locality, although in his 1949a publication it is mentioned that he has two clutches both found in June in West Java.

In Hans Bartels' handwritten list of acquisitions until 1927 (ms. A) six clutches of *F. severus* are listed (*cf.* Fig. 2, no. 5), not just the five that were present when Hellebrekers described the collection. For four clutches Hans Bartels also took the egg measurements (ms. C), but not for the four-egg clutch collected on 5 April 1927 (*cf.* Fig. 2, no. 5, sixth entry). The same four-egg clutch is missing from the Bartels collection at RMNH. In Hoogerwerf's collection there is a four-egg clutch (RMNH 75496) with no locality or date. I measured the four-egg clutch in the Bartels collection as 36.3 × 32.0, 37.3 × 31.9, 34.9 × 31.8 and 36.8 × 31.0 mm (ms. G), and the clutch in the Hoogerwerf collection as 36.2 × 31.9, 37.3 × 32.0, 35.0 × 31.8 and 36.9 × 30.8. All this indicates that RMNH 75496 was taken from the Bartels collection, for which the original data are '1/4, collected at Pangerango on 5.4.1927, slightly incubated'.

Some manipulation of the remaining clutches has apparently also taken place. Comparison of Hans Bartels' data (Fig. 2, no. 5) with Hellebrekers *in* Hellebrekers & Hoogerwerf (1967) shows that the original single egg taken from a three-egg clutch on 6 June 1921 (r means rot, i.e. putrid; which nest contained also 2 downy pulli), 2/2 and 2/3 as noted by Hans Bartels, 11 eggs in total, became 4/2 and 1/3 (also 11 eggs) according to Hellebrekers. As the measurements and data for all the eggs taken by Hans Bartels are available, the five clutches can probably be restored to their original compositions and given their true collection information.

6. **CRESTED SERPENT EAGLE** *Spilornis cheela*

(*a*) Hoogerwerf (1949a: 35): [Examined material; seven eggs (seven clutches). Clutch size one, sometimes two. Average measurements 62.71 × 49.77 mm (7); breeding months Central Java: Feb. (1), Apr. (1), Jun. (2), Jul. (1), Aug. (1).] Eggs are depicted in Plate II, Fig. 21 and Plate III, Fig. 22.

(*b*) Hellebrekers (1967: 21): 'Bartels: 3/1; February (2), March (1); W. Java. Measurements (3); av. 61.3 (59.6–63.1) × 49.7 (48.1–51.6). Weight (3): av. 6.30 (5.75–6.65)'.

(*c*) Hoogerwerf (1967): 'Weight (3/1): av. 6.667 (6.038–7.005). For ten previously recorded breeding dates and seven earlier measured eggs see Hoogerwerf (1949a: 35, Plate III, Figs. 21, 22)'. (This cross-reference is incorrect: it should be Plate II, Fig. 21 and Plate III, Fig. 22; see above.)

(*d*) Hoogerwerf private collection: three clutches of 1/1, including RMNH 75492, 75493 and 75494.

Two of these three eggs in Hoogerwerf's collection I recognised immediately as originating from the Bartels collection. Egg RMNH 75494 is remarkable in being rather large and broad, and having characteristic bold blotches at its smaller end. This means it can easily be individually identified, as *S. cheela* eggs are almost always unmarked plain white. This egg is depicted by Hoogerwerf (1949a, Plate III, Fig. 22). A similar, large and rather broad, boldly blotched *Spilornis* egg, collected 17 March 1907 (ms. A; *cf.* Fig. 2, no. 6, first entry, *Spilornis bacha*), is missing from the Bartels collection in RMNH. I examined this egg before the war and my measurements of 62.1 × 49.0 mm (ms. G) are identical to those of RMNH 75494 in the Hoogerwerf collection (62.1 × 48.9 mm). In contrast to the data given by Hoogerwerf in his collection, 'February 1943, N0.222,1/1' and formerly asserted to be collected in 'Central Java' (Hoogerwerf 1949a), the real data are: 'Mt. Pangrango, W. Java, 17 March 1907, 1 egg, zw. bebr. [= hard set]' (ms. A; Fig. 2, no. 6, first entry).

Egg RMNH 75492 is most remarkable, and therefore individually identifiable, by its very large size, 71.0 × 52.2 mm. It was labelled by Hoogerwerf only 'W. Java', without any date and no precise locality, although Hoogerwerf (1949a) indicated that all his seven eggs were from Central Java. This egg is also from the Bartels collection, taken according to Max Bartels Jr.'s acquisition list of 1933 on '9 Febr. 1933' at 'Tjiparay (Tjibogo), W. Java', and mentioned by him as 'groot' [=large] in the margin of his notebook page under *Spilornis bido* (ms. E,b; *cf.* Fig. 3, no. 6b, second entry). I measured it before the war as 71.0 × 52.3 mm (ms. G).

Another *Spilornis bido* egg mentioned by Bartels in his 1933 list (ms. E,a; *cf.* Fig. 2, no. 6a, final entry), collected 13 February 1933 and also referred to in his notebook (*cf.* Fig. 3, no. 6b, fourth entry), is also plain and unmarked. It was exceptionally small for a *Spilornis* egg and hence noted by Bartels as 'klein' (= small) in the margin of his notebook. It measured 61.5 × 52.3 mm (ms. G) and has the original label 'Tjiparay (Tjibajawak), (W. Java), 13 Febr. 1933'. This egg is still present in the Bartels collection (RMNH 38819).

7. **JAVAN OWLET** *Glaucidium castanopterum*

(*a*) Hoogerwerf (1949a: 102): [Examined material: two eggs, (one clutch) no particulars given; breeding season: W. Java, March (1). Both examined eggs ex. coll. Bouma].

(*b*) Hellebrekers (1967: 59): 'Bartels: 4/2; February (2), March (1), April (1); Tji Karang and Rawa Kalong (both in the Preanger district), West Java. Measurements (8): av. 33.5 (31.5–34.7) × 29.5 (28.6–30.0). Weight (8): av. 1.09 (0.90–1.22)'.

(*c*) Hoogerwerf (1967): 'Weight (1/2) 1.032, 1.051. For one previously recorded breeding date and the measurements of both of these eggs originating from Gundih, near Semarang, Central Java, see Hoogerwerf (1949: 102). This owl is very rare in Java'.

(*d*) Hoogerwerf private collection: 1/2 clutch, labelled 'West Java, No. 229, March', with no further details (RMNH 75696).

Hoogerwerf (1949a) implied that the clutch he referred to was from the Bouma collection and was collected in West Java. In Hellebrekers & Hoogerwerf (1967), Hoogerwerf explicitly referred to the same eggs. This time he stated that they were from Gundih, Central Java, but still implied that they were his own, as he did not mention the Bouma collection. In Hoogerwerf's collection now at RMNH there is again the reference to 'W. Java', but without any further detail as to the origin of the clutch.

At the same time Hellebrekers made no mention of the clutch noted by Hans Bartels as having been collected at Mt. Masigit (*cf.* Fig. 3, no. 7, first entry). I measured that clutch before the war as 32.3 × 28.9 and 32.4 × 28.5 mm (ms. G). The clutch in the Hoogerwerf collection at RMNH has identical measurements, 32.3 × 29.0 and 32.3 × 28.5. I therefore believe that RMNH 75696 is the clutch collected by H. Bartels at 'Mt. Masigit, W. Java on 4 March 1927, 2 eggs, slightly incubated'.

8. **ORANGE-BREASTED TROGON** *Harpactes oreskios*

(*a*) Hoogerwerf (1949a: 113): [Examined material: four eggs, 2/2. Clutch size two eggs, breeding months: February (x), June (x), October (x)]. Eggs figured in Plate X, Fig. 114.

(*b*) Hellebrekers (1967: 66): 'Bartels 3/2; May, June, October; W. Java. Measurements (6): av. 26.7 (25.0–29.0) × 21.7 (21.4–22.3). Weight (6): av. 0.44 (0.40–0.50)'.

(*c*) Hoogerwerf (1967): 'Weight 2/2: av. 0.441 (0.405–0.485); maximal variation in the same clutch: 0.080 (0.405–0.485). For three previously recorded breeding dates and measurements of these four eggs originating from Mount Pangerango and Mount Salak, West Java, see Hoogerwerf (1949a: 113, Plate X, Fig. 114)'.

(*d*) Hoogerwerf private collection: 2/2: one labelled by Hoogerwerf 'W. Java, (Tjibodas?), June, eggmark 2' (RMNH 75710), the other 'W. Java, (Tjibodas?), October, eggmark 1' (RMNH 75711).

Again, the lack of consistency between Hoogerwerf's publications (two clutches in 1949a without a locality, and in 1967 'from Mount Pangrango and Mount Salak') and his private collection (two clutches from 'Tjibodas?') is remarkable.

In Hans Bartels' handwritten list of acquisitions to 1927 (ms. A), there are four two-egg clutches (Fig. 3, no. 8) and not three as stated by Hellebrekers in 1967. I took measurements of all the eggs concerned before the war (ms. G), as well as of the eggs from Hoogerwerf's collection at RMNH. Those of Hoogerwerf's June clutch from 'Tjibodas?', 28.6 × 22.7 and 28.6 × 22.2 mm (RMNH 75710), agree with those of Bartels' '10 June 1923 clutch from Tjireunden', 28.6 × 22.6 and 28.5 × 22.2 (Fig. 3, no. 8, fourth entry). Those of Hoogerwerf's October clutch from 'Tjibodas?', 26.9 × 21.0 and 26.9 × 20.9 mm (RMNH 75711), agree with those (26.9 × 21.0 and 26.9 × 20.9 mm) of the clutch collected by Max Bartels Jr. in October 1934 on the lower slopes of Mt. Pangrango. This latter clutch was not in the Bartels collection as described by Hellebrekers (1967), nor, having been collected in October 1934 was it registered in Hans Bartels' list (ms. A) from 1927. It is, however, clearly the true origin of RMNH 75711.

9. **WHITE-BELLIED WOODPECKER** *Dryocopus javensis*

(*a*) Hoogerwerf (1949a: 134): [Examined material: one egg, clutch size: Bartels: three eggs. Measurements of the above-mentioned egg: 31.80 × 24.40 mm. Breeding months: E. Java September (1); Bartels W. Java August (x)].

(*b*) Hellebrekers (1967: 78): 'Bartels: No material available'.

(*c*) Hoogerwerf (1967): 'Weight (1/1): 0.847. For two previously recorded breeding dates and the measurements of this egg originating from the Houwing collection, see Hoogerwerf (1949a: 134)'.

(*d*) Hoogerwerf private collection: one egg, labelled '1/1, East Java, September (no year), leg. A. Hoogerwerf' (RMNH 75743). In the egg box a note in Hoogerwerf's handwriting reads 'laid in captivity'.

Combining the above information, the single egg of this large woodpecker, mentioned in all three Hoogerwerf publications, came from the Houwing collection and was laid in captivity. J. Houwing lived as planter on the north coast of West Java near Subang and never collected in East Java, so why did Hoogerwerf indirectly link the East Java egg (Hoogerwerf 1949a) with Houwing (Hoogerwerf 1967)? The information in Hoogerwerf (1949a) shows that Hoogerwerf must at least have seen the Bartels' original label for this species, because he mentioned a complete clutch of three eggs. Hoogerwerf again gave neither precise collection date nor locality, which is remarkable for a species so rare on Java.

Ernst Bartels collected a three-egg clutch on 23 September 1927, at the Kole Beres Tea Estate, Mt. Patuha, West Java. There were originally three eggs, but he dispatched them unblown by ordinary mail to his brother Hans in Pasir Datar and only one survived the transport. Hans entered the acquisition (ms. B; *cf.* Fig. 3, no. 9, second entry). He measured the surviving egg as '32.0 × 24.6 mm' and mentioned it under the name *Thriponax* on 16 October 1927 to his brother Max, nicknamed Bango (the Indonesian name for Lesser Adjutant *Leptoptilos javanicus*), in Bern (ms. C; *cf.* Fig. 3, no. 9a) with the remark 'andere eggs lapoer!' ['other eggs broken!']. Ernst Bartels described this discovery (Bartels 1931: 329).

Hoogerwerf (1949a) stated the egg in his collection to be 31.80 × 24.40 mm, which is within a measurement error of 0.2 mm the same as for Ernst Bartels' egg. At the same time, Hellebrekers in 1967 stated that there was no material of this species present in the Bartels collection. Given these facts, there is, in my view, no doubt that the egg from the Hoogerwerf collection is in fact the sole surviving egg from the three-egg clutch collected by E. Bartels. Hoogerwerf's notation 'laid in captivity' is therefore untrue. The implication that this species breeds in East Java is also unsupported. The egg remains the only one of this species from Java.

10. **RUFOUS WOODPECKER** *Celeus brachyurus*

(*a*) Hoogerwerf (1949a: 130): [Examined material three eggs, clutch size three, average 25.67 × 20.0 mm, length variation 25.20–26.50; breadth variation 19.70–20.30; longest egg 26.50 × 19.70; broadest egg 25.30 × 20.30. Breeding months West Java: April (x) and September (1)]. Plate XI, Fig. 126. No locality or collecting date(s) given.

(*b*) Hellebrekers (1967: 75): 'Bartels collection: no material available'.

(*c*) Hoogerwerf (1967): 'One egg, weight 0.310 g. For two previous recorded breeding dates and three earlier measured eggs see Hoogerwerf (1949a: 130, Plate XI, Fig. 126); this woodpecker is rare in Java'.

(*d*) Hoogerwerf private collection: no material.

Hoogerwerf (1949a) gives neither collecting date nor locality for the clutch of three eggs (1/3) in his collection. In 1967 he implied that he possessed only one egg, but none was present when his collection was acquired by RMNH.

In Hans Bartels' handwritten list of acquisitions to 1927 (ms. A), a three-egg clutch is entered under *Micropternus brachyurus*, collected on '02.09.1919, Tji-Londong, Preanger, W. Java' (*cf.* Fig. 4, no. 10). The eggs were '1. bebr.' [slightly incubated]), hence a 'full clutch'. The measurements I took before the war (26.5 × 19.7, 25.3 × 20.3 and 25.2 × 20.0 mm) are practically identical to those mentioned by Hoogerwerf (1949a) (ms. G), and Hellebrekers stated that the species was not represented in the Bartels collection in 1967.

I have no doubt that the clutch described by Hoogerwerf (1949a) is indeed the clutch missing from the Bartels collection. The single egg weight mentioned by Hoogerwerf (1967) probably also came from this clutch. In my earlier attempts to get the present paper published I mentioned these conclusions. I suspect that in response to my earlier manuscript, which he saw, Hoogerwerf destroyed the clutch in order to remove any evidence of its origin.

11. **BANDED BROADBILL** *Eurylaimus javanicus*

(*a*) Hoogerwerf (1949a: 136): [To me the eggs of this species are unknown.]

(*b*) Hellebrekers (1967: 79): 'Bartels: 1/2, 1/3; April, December; Mount Massigit and Mount Pangerango, West Java. Measurements (5): av. 28 (27.6–29) × 21.2 (20.7–22.2). Weight (5): av. 0.300 (rather large holes) and 0.375'.

(*c*) Hoogerwerf (1967): '1/2; June; Mount Salak, West Java. Measurements: 31.2 × 20.2, 31.5 × 20.1. Weight (2): 0.364, 0.391. Not previously recorded by me. For some earlier particulars derived from literature see Hoogerwerf (1949a: 136). The species is rare in Java'.

(*d*) Hoogerwerf private collection: no material present.

Hoogerwerf in 1949 did not know the eggs of this species, but in 1967 he claimed to possess a two-egg clutch; yet when his private collection was acquired by RMNH in 1977 no eggs were present.

In Hans Bartels' handwritten list of acquisitions to 1927 (ms. A), two two-egg clutches and one three-egg clutch are entered (*cf.* Fig. 4, no. 11). Hellebrekers, however, mentions only single two- and three-egg clutches as present in the Bartels collection in 1967. Hoogerwerf's 1967 measurements for the two-egg clutch in his collection (see above) are exactly the same (31.2 × 20.2 and 31.5 × 20.1 mm) as mine from 1940 at the home of Max Bartels Jr. for a two-egg clutch from Mt. Masigit collected by Hans Bartels on 6 June 1922 (ms. G). In my opinion Hoogerwerf's clutch is that taken by Bartels. Hoogerwerf may have destroyed this clutch, too, to remove evidence of its theft.

12. **WREATHED HORNBILL** *Rhyticeros undulatus*

(*a*) Hoogerwerf (1949a): [To me the eggs of this species are unknown.]

(*b*) Hellebrekers (1967): not mentioned.

(*c*) Hoogerwerf (1967): not mentioned.

(*d*) Hoogerwerf private collection: not present.

In Max Bartels Jr.'s daily egg acquisition list for 1940–42 (ms. D) mention is made of three clutches: (a) '09.08.1941: 2 eggs slightly incubated, Cikuda, Cisarakan'; (b) '10.08.1941, 1 egg fresh, Citapeu, Mt. Rompang'; (c) '23.08.1941, 2 eggs hard set, Ciseureuh, Cibutun' (*cf.* Fig. 4, no. 12, entries 4, 6 and 12, indicated by arrows). All these clutches, from a species of which only a very few clutches were ever collected, disappeared from the Bartels collection. As with clutches of other rare species mentioned above, Hoogerwerf may have first taken these clutches for his own collection, and then destroyed them following my manuscript of 1969; see Discussion. The clutches of the commoner species collected by Max Bartels Jr. in 1940–42 are, however, all still in the Bartels collection in RMNH.

13. **LARGE WOOD SHRIKE** *Tephrodornis gularis*

(*a*) Hoogerwerf (1949a: 143): [To me the eggs of this species are unknown.]

(*b*) Hellebrekers (1967: 83): 'Bartels collection: 1/2, March, Mount Massigit, Preanger, W. Java; measurements (2): 21.6 × 15.7 and 21.9 × 16.5. Weight (2) av. 0.16'.

(*c*) Hoogerwerf (1967): '1/2, March, Mount Salak (near Bogor), W. Java. Measurements: 21.4 × 15.6 and 21.7 × 16.4. For some previous published particulars see Hoogerwerf (1949a: 143). This species is not common in Java'. No weight is given.

(*d*) Hoogerwerf private collection: no eggs of this species.

It is remarkable (1) that Hoogerwerf stated in 1949 that he did not know the eggs of this species, (2) that after leaving Indonesia he claimed to possess a clutch of two in his own collection, without giving a collection date, and (3) that the clutch was not present when his collection was acquired by RMNH ten years later. At the same time the measurements given by Hoogerwerf for his own clutch are, within an error of 1%, identical to those given by Hellebrekers for the clutch in the Bartels collection. The entry for this species in Hans Bartels' egg list (ms. A) appears in Fig. 4, no. 13, under *Tephrodornis virgatus*. I described this clutch before the war, and measured the two eggs as 21.5 × 15.6 mm (0.153 g) and 21.8 × 16.5 mm (0.167 g), averaging 0.160 g (ms. G). In my opinion all three sets of measurements refer to the same clutch, collected by H. Bartels on 18 March 1923 at Mt. Masigit and even now present in the Bartels collection (RMNH 39474). Apparently Hoogerwerf (1967) faked possession of a clutch of *T. gularis*, hence its absence from the Hoogerwerf collection on arrival at RMNH in April 1977. Large Wood Shrike is rather rare on Java and its small nests are very hard to find. The Bartels clutch was unique for Java and possibly the entire Indo-Australian region, excluding India (Ali & Ripley 1971).

14. **SCALY THRUSH** *Zoothera dauma*

(*a*) Hoogerwerf (1949a: 177): [Examined material: four eggs (two clutches). Clutch size: two eggs. Measurements: average 31.20 × 22.70 mm; length variation: 28.80–33.70, breadth variation: 22.40–23.30; longest egg 33.70 × 22.50; broadest egg: 33.0 × 23.30 mm. Breeding months Jan. (1), June (1); Plate XIV, Fig. 190].

(*b*) Hellebrekers (1967: 105): 'Bartels: 1/1, 3/2; September (3), November (1); West Java. Measurements (7): av. 34.4 (32.8–36.5) × 22.8 (22.1–23.6). Weight (7): av. 0.45 (0.39–0.51)'.

(*c*) Hoogerwerf (1967): 'Weight (2/2): av. 0.433 (0.417–0.446); maximal variation in the same clutch: 0.029 (0.417–0.446). For two previously recorded breeding dates and the measurements of these four eggs see Hoogerwerf (1949a: 177, Plate XIV, Fig. 190)'.

(*d*) Hoogerwerf private collection: '2 eggs, W. Java (no locality, no date)' (RMNH 76012), and '2 eggs, Mt. Salak, Tjiapoes, W. Java, 15 June 1940' (RMNH 76013).

In Hoogerwerf (1949a) and Hoogerwerf (1967) no precise dates, only months, and no localities are given for the two clutches that Hoogerwerf implied were from his own collection. When his collection came to RMNH in April 1977, a date and locality were included for one clutch (RMNH 76013), and an approximate locality and no date for the other (RMNH 76012). These represent remarkable inconsistencies in Hoogerwerf's own accounts.

In Hans Bartels' handwritten list of clutches to 1927 (ms. A), a one-egg and three two-egg clutches are entered under *Oreocichla horsfieldi* (*cf.* Fig. 4, no. 14). At least one additional two-egg clutch was added to the Bartels collection subsequently as evident from the acquisition lists of Max Bartels Jr. (ms. D). A clutch collected on 13 June 1918 (ms. A; Fig. 4, no. 14, first entry) was not present in the Bartels collection as described by Hellebrekers, and Hellebrekers does not mention June as a breeding month. I measured this clutch before the war as 33.8 × 22.5 and 33.1 × 23.4 mm (ms. G). These measurements are identical to ones I have recently taken of Hoogerwerf's Mt. Salak clutch (RMNH 76013). I therefore believe that RMNH 76013 was collected at Mt. Gede on 13 June 1918.

The clutch mentioned in Fig. 3 (no. 6b, first entry), derived from E,b, under the name '*Oreocichla horsfieldi* [= *Zoothera dauma*], 1/2, Mt. Gede, 13 Nov. 1932', however, is still in the Bartels collection (RMNH 40315).

15. **SPOTTED CROCIAS** *Crocias albonotatus*

(*a*) Hoogerwerf (1949a: 196): under *C. guttatus* [Examined material: two eggs. Clutch size two eggs. Measurements of both eggs: 24.60 × 18.0 and 24.90 × 17.60 mm. Breeding months March (x), December (1), Plate XV, Fig. 214].

(*b*) Hellebrekers (1967: 117): 'Bartels: 2/1, 3/2; April (2), May (2), June (1); W. Java. Measurements (8); av. 23.8 (22.4–25.6) × 17.7 (16.9–18.1). Weight (7): av. 0.20 (0.19–0.22)'.

(*c*) Hoogerwerf (1967): '1/2; March; West Java. Measurements: 23.2 × 18.2, 23.9 × 18.1. Weight (2/2): av. 0.227 (0.210–0.242); maximal variation in the same clutch: 0.013 (0.210–0.223). For two previously recorded breeding dates and two earlier measured eggs see Hoogerwerf (1949a: 196, Plate XV, Fig. 214)'.

(*d*) Hoogerwerf private collection: 'Tjibodas, W. Java' (RMNH 76238) and 'Tjibodas, March' (RMNH 76239).

Hoogerwerf (1949a) mentioned two eggs without locality, and in 1967 a two-egg clutch also collected by him, without details of locality and no exact date (only March). In his collection at RMNH there are two two-egg clutches, both undated but with the locality 'Tjibodas'.

In Hans Bartels' handwritten list until 1927 (ms. A), a single one-egg and three two-egg clutches are entered under *Laniellus leucogrammicus* (*cf.* Fig. 5, no. 15). Other clutches were subsequently added and in the Bartels collection at RMNH five clutches are mentioned (2/1, 3/2). The second clutch (1/2) in the series reported by Hans Bartels (ms. A), collected on 29 March 1921, is missing, but the others are still present. I measured the missing clutch before the war as 24.0 × 18.2 and 23.3 × 18.3 mm (ms. G), which is within 0.2 mm of the measurements of Hoogerwerf's 'Tjibodas, March' clutch (RMNH 76239). Hoogerwerf's clutch from 'Tjibodas, March' therefore does not come from the north-east side (i.e. 'Tjibodas') of Mt. Pangerango but from the south-west side (Pasir Datar), where Max Bartels Sr. lived and did most of his collecting. The data for this clutch are '29 March 1921, 2 eggs (1/2), 1. bebr. [slightly incubated]'.

16. **YELLOW-BELLIED WARBLER** *Abroscopus superciliaris*

(*a*) Hoogerwerf (1949a: 210, Plate XVII, Fig. 238): under *Seicercus superciliaris vordermani* [Examined: three eggs (one clutch). Clutch size: three eggs. Measurements: av. 14.40 × 11.50, length variation 14.30–14.50, breadth variation 11.40–11.50, longest egg 14.50 × 11.50, broadest egg 14.50 × 11.50. This clutch was found in W. Java in October].

(*b*) Hellebrekers (1967: 126): 'Bartels: no material available'.

(*c*) Hoogerwerf (1967): 'Weight (1/3) av. 0.049 g (0.048–0.049 g). For one previously recorded breeding date and measurements of the three eggs see Hoogerwerf (1949: 210, Plate XVII, Fig. 238)'.

(*d*) Hoogerwerf private collection: No material present.

Hoogerwerf implied in 1967 that his 1949a clutch was still present in his private collection, because he measured its weights, but it had vanished by 1977. Of this clutch Hoogerwerf elsewhere (Hoogerwerf 1950a: 110–111, under *Seicercus superciliaris vordermani*), in Dutch, mentioned that the nest was obtained above Tjiomas estate, on the lower slope of Mt. Salak, at *c.*800 m, i.e. near his own house. He also stated that the nest was found in a clump of bamboo, resting on a bamboo stump.

Hellebrekers stated that there was no material in the Bartels collection in RMNH. However, in Max Bartels Jr.'s acquisition list (ms. D) there is an entry, '*Abrosc. superc.*' collected '20 October 1940, 3 eggs slightly incubated' (*cf.* Fig. 5, no. 16, eighth entry, indicated by an arrow). At the time Max Bartels Jr. wrote to me 'The nest was found in a *hole of an internal node* of a cut-off bamboo stem in a bamboo forest at approx. 1000 m a.s.1. near Ciparay, Mt. Pangrango' (ms. F). The measurements I took for this clutch soon after were 14.5 × 11.4, 14.3 × 11.4 and 14.4 × 11.5 mm) (ms. G), almost identical to those presented by Hoogerwerf for his clutch. As I was personally involved in the discovery, there exists an extensive correspondence (ms. F) between Max Bartels Jr. and myself about this finding. The clutch represented the first nesting record for Java in *c.*50 years of egg collecting by the Bartels family, although the species is locally not particularly rare.

In my opinion the clutch in Hoogerwerf's collection was stolen by him from the Bartels collection, and his nesting site description is incorrect. In my earlier manuscript I accused Hoogerwerf of having taken this clutch, and it seems likely that he then destroyed the eggs so that it could not be used as evidence against him.

17. **CRIMSON-BREASTED FLOWERPECKER** *Prionochilus percussus*

(*a*) Hoogerwerf (1949a: 232): under *Anaimos p. percussus* [To me the eggs of this species are unknown].

(*b*) Hellebrekers (1967: 138–139): 'Bartels: 1/1, 1/2; April; Tji Kahuripan, Preanger, West Java. Measurements (3): av. 16.4 × 11.6. Weight (3): av. 0.060'.

(*c*) Hoogerwerf (1967): '1/2; April; W. Java. Measurements: 15.7 × 11.3, 15.8 × 11.3. Not previously recorded from Java; the species is perhaps fairly rare in this island'.

(*d*) Hoogerwerf private collection: no material present.

This is a rather rare and very local species. It is strange that Hoogerwerf (1949a) claimed not to know its eggs, but in 1967 had a clutch (1/2) collected by himself, yet that by 1977 his private collection contained no examples of this species' eggs. Moreover, Hoogerwerf did not give a precise date or the locality where he obtained this clutch. Finally, although he later weighed all the eggs and clutches of his collection in the Netherlands, the weights of this clutch were not included.

In my opinion Hoogerwerf's clutch never existed. He had seen the clutch in the Bartels collection, or he copied his (1967) egg description from Hellebrekers, 'brownish primary points and speckles, forming an almost closed zone around the larger end'. I think that he invented the egg measurements, perhaps in order to make his collection appear more important.

The Bouma collection

18. **ASIAN PIED HORNBILL** *Anthracoceros albirostris*

(*a*) Hoogerwerf (1949a: 122, Plate XI, Fig. 121): under *A. malabaricus convexus* [Examined material: two eggs (one clutch). Clutch size two eggs. Measurements: av. 51.95 × 33.90 mm, length variation 51.80–52.10, breadth variation 33.70–34.10, longest egg 52.10 × 33.70, broadest egg 51.80 × 34.10. The above-mentioned clutch was collected in Central Java in November. The two above-mentioned examined eggs of this species are ex collection Bouma].

(*b*) Hellebrekers (1967: 71): 'Bartels: No material available'.

(*c*) Hoogerwerf (1967): 'Weight (1): 2.938. For one previously recorded breeding date and two earlier measured eggs see Hoogerwerf (1949: 122, Plate XI, Fig. 121)'.

(*d*) Hoogerwerf private collection: '2 eggs, Gundih, Java, 11.11.1936, A. Hoogerwerf' (RMNH 75722).

Note that in Hoogerwerf's private collection, as opposed to Hoogerwerf (1949a), there was no longer any mention of this clutch originating from the Bouma collection. This clutch, unique for Java, was collected by P. J. Bouma and later presented to Max Bartels Jr. for incorporation into the Bartels collection (see The egg collections involved). My measurements of this clutch while still in the Bartels collection, 51.9 × 34.1 and 52.1 × 33.9 mm (ms. G), are almost identical to those by Hoogerwerf. He must have moved this clutch from the Bartels collection to his own whilst both the Bartels and Bouma collections were accessible to him at the Bogor museum.

Some other clutches from the Bouma collection appropriated by Hoogerwerf

All clutches in Hoogerwerf's private collection with the locality Gundih, Central Java, are in fact Bouma's material. There is no evidence that Hoogerwerf ever collected in Gundih, other than the many clutches labelled 'Gundih' in his private collection. In addition to the above-mentioned two-egg clutch of *Anthracoceros albirostris* the following examples can be given. A large number of other clutches in Hoogerwerf's collection, taken at Gundih in the year 1936, but with no locality recorded, clearly also derive from the Bouma collection.

There were in Hoogerwerf's collection at the time of his death many clutches labelled 'Gundih', all of rarer species. Gundih was Bouma's principal collection locality. It is highly unlikely that Hoogerwerf collected in Gundih in e.g. March, April, May and November

1936 (see below) while living in Bogor. Hoogerwerf must have taken the many clutches missing from the Bouma collection (see above), and incorporated them into his own without indicating that they had been collected by Bouma. RMNH thus registered them as having been collected by Hoogerwerf.

19. **BLACK-THIGHED FALCONET** *Microhierax fringillaris*: Gundih, Central Java, 1/4, 9 November 1936 (RMNH 75495).

20. **RED-LEGGED CRAKE** *Rallus fasciata*: Gundih, Central Java, 1/4, 1936 (RMNH 75541).

21. **DRONGO CUCKOO** *Surniculus lugubris*: Gundih, Central Java, eggs with Horsfield's Babbler *Trichastoma sepiarium*, 29 November 1935 (RMNH 75680) and 20 April 1936 (RMNH 75681).

22. **HOODED PITTA** *Pitta sordida*: Gundih, Central Java, three clutches: 1/5, 20 March 1936; 1/3, 25 March 1936; 1/5, 6 April 1936 (RMNH 75744–46).

23. **BLACK-HEADED BULBUL** *Pycnonotus atriceps*: Gundih, Central Java, four clutches: 1/2, 26 March 1936; 1/2, 11 April 1936; 1/2, 21 April 1936; 1/3, 20 May 1936 (RMNH 76567–70).

24. **BLACK-NAPED MONARCH** *Hypothymis azurea*: Gundih, Central Java, two clutches: 1/2, 10 March 1936; and 1/2, 24 March 1936 (RMNH 76380–81).

The above list is far from exhaustive. It concerns examples where collection details were fortunately not changed by Hoogerwerf, other than that he implied having collected the clutches himself. I do not know whether Hoogerwerf also changed the collection details of eggs in the Bouma collection, as he did with clutches from the Bartels collection, because I did not measure the eggs of the Bouma collection.

The Becking collection

The following data are notes, egg measurements, fresh egg and eggshell weights from the private Becking collection (ms. H). I mentioned these data in my manuscript of 1969 commenting on Hellebrekers & Hoogerwerf (1967). All these clutches disappeared from the Becking collection while it was stored at the Bogor museum during and shortly after the Pacific War (as described in my draft publication).

25. **GREEN PEAFOWL** *Pavo muticus*

(*a*) Hoogerwerf (1949a: 45, Plate IV, Fig. 30): [Examined material: ten eggs (three clutches and one odd egg). Clutch size: 3–4 eggs. Measurements: av. 73.39 × 54.22, length variation 69.80–79.10, breadth variation 52.60–56.40, longest egg 79.10 × 53.30, broadest egg 71.80 × 56.40 mm. Breeding months: W. Java Aug. (x), Sept. (1), Oct. (x); Central Java Oct. (1); E. Java Sept. (1)].

(*b*) Hellebrekers (1967: 26): 'Bartels: 1/2, October. Gundih, Djuworo, Central Java. Measurements (2): av. 68.5 × 50.0. Weight: 11.04 and 12.77.

(*c*) Hoogerwerf (1967). '2/2; September; East and West Java. Measurements (4) av. 76.13 (74.5–79) × 53.53 (52.5–54.8. largest egg: 79 × 53; maximal variation in length in the same clutch: 2.5 (76.5–79). Weight (2/2, 1/4: av. 14.655 (13.162–15.870); maximal variation in the same clutch: 1.980 (13.508–15.488). For 18 previously recorded breeding data and 10 earlier measured eggs from Ujung Kulon nature reserve, West Java, see Hoogerwerf (1949: 45, Plate IV, Fig. 30)'.

(*d*) Hoogerwerf's private collection contains three eggshells (1/2) of this species labelled 'W. Java, without date' (RMNH 75515); (1/4) 'Udjung Kulon, W. Java, 30.09.1942' (RMNH 75516) and (1/2) 'Merak, W. Java, 28.09.1943' (RMNH 75517).

The clutch (1/2) in Hoogerwerf's collection 'W. Java, without date' (RMNH 75515) is from the Becking collection. These eggs were collected in the teak *Tectona grandis* forests of Central Java and were a gift from a friend (ms. H; *cf.* Fig. 5, no. 25). I originally wrote on them in red ink '23 Sept. 1944, Randublatung, Central Java'. The ink has been largely removed, leaving an artificial pink wash to the shells, although on close inspection some lettering and figures are still faintly visible. Apart from this, one of the eggs has a natural scar by which I could recognise it immediately (*cf.* Fig. 10).

Other clutches from the Becking collection appropriated by Hoogerwerf

The following clutches, mentioned in my previous attempt to bring Hoogerwerf's actions to light, disappeared from the Becking collection whilst in storage at Bogor. They were presented as part of his own collection by Hoogerwerf (1949a) but were no longer present when it came to RMNH after his death. In response to my 1969 draft he probably destroyed these clutches.

26. **REEF EGRET** *Egretta sacra*

Clutch: 26 July 1941, 1/4, Palabuanratu (Wijnkoopsbaai), Cikepuh, Batu Beula. Measurements: 41.0 × 32.7; 42.0 × 33.9; 44.2 × 33.8; 41.5 × 33.3 mm. (ms. H; *cf.* Fig. 6, no. 26)

Of the three clutches I collected on the same day and at the same locality (*cf.* Fig. 6, no. 26), this 1/4 and the 1/2 clutch disappeared from our collection while it was in storage at Bogor. The 1/1 clutch, also of the same date and locality, was left untouched.

27. **CRESTED GOSHAWK** *Accipiter trivirgatus*

Clutch: 3 March 1944, 1/2, Kp. Cibogo, Bogor. Measurements: 44.8 × 37.2, 45.0 × 35.3 mm. Shell weight 1.20 and 1.27 g; fresh weight 33.25 and 30.00 g. (ms. H; *cf.* Fig. 6, no. 27)

28. **BESRA** *Accipiter virgatus*

Clutch: 10 April 1941, 1/2, Arcamanik, Mt. Geggerbintang, Bandung. Measurements: 36.1 × 29.7 and 35.7 × 29.3 mm. Shell weights 1.22 and 1.22 g. (ms. H; *cf.* Fig. 7, no. 28)

Of this clutch, and the preceding one, I also have watercolours.

29. **CHANGEABLE HAWK-EAGLE** *Spizaetus cirrhatus*

Two clutches: 6 June 1941, 1/1 Cibadak, Mt. Walat, dessa Ciantajan, Sukabumi, leg. M. Bartels Jr. Measurements: 67.5 × 54.3 mm, shell weight 6.427 g, and 16 August 1941, 1/1 Cikawung, Cireundeun, Sukabumi, leg. M. Bartels Jr. Measurements: 61.4 × 50.7 mm, shell weight 7.975 g. (ms. H; *cf.* Fig. 7, no. 29)

These two clutches were gifts of Max Bartels Jr. to our collection. Both disappeared during the war whilst in the Bogor museum. The clutch of 16 August 1941 is mentioned in Bartels' handwriting (*cf.* Fig. 4, no. 12, ninth entry) with the notation (Be). The pullus (white phase) of Changeable Hawk-Eagle, collected on 18 August 1944 at Cidjulang, Pasir Maung (Fig. 7, no. 29, first entry), remained in our collection and is now in Leiden (RMNH 24192).

30. **MANGROVE WHISTLER** *Pachycephala grisola*

Clutch: 18 February 1945, 1/2, Botanical Gardens, Bogor. Measurements: 21.3 × 15.9 and 21.4 × 15.9 mm, shell weight 0.165 and 0.159 g, fresh weight 2.91 and 2.91 g. (ms. H; *cf.* Fig. 7, no. 30)

Of the two clutches indicated in our typescript, made immediately after the discovery, that dated 18 February 1945 (fresh eggs) disappeared, while the 9 February 1945 (hard-set) clutch remained.

31. **CRIMSON SUNBIRD** *Aethopyga siparaja*
Four clutches, all from Depok (07°25′S, 109°37′E), on the main road between Bogor and Jakarta, had the following data: (a) 25 June 1944, 1/2, 14.2 × 10.7 and 14.6 × 10.3 mm, hard-set, shell weight 0.032 g; (b) 25 June 1944, 1/2, 15.6 × 11.0 and 15.4 × 10.7 mm, hard-set, fresh egg weights 0.83 and 0.87 g, shell weights 0.039 and 0.038 g; (c) 17 December 1944, 1/2, 15.7 × 10.8 and 14.1 × 10.2 mm, fresh, fresh egg weights 0.81 and 0.85 g, shell weights 0.042 and 0.037 g; (d) 26 December 1944, 1/2, 13.8 × 10.9 and 14.0 × 10.8 mm, shell weights 0.042 and 0.042 g (ms. H; *cf.* Fig. 8, no. 31). All these eggs disappeared from their boxes, except one egg from the hard-set 1/2 clutch (b).

Furthermore, a conceptual paper of mine in manuscript advocating a classification system for egg shapes into five main classes, according to a mathematical formula containing the ratio length and width of the egg, and the position of its greatest width along the long axis (*cf.* Fig. 9), was held for a time at the Bogor museum. The manuscript was apparently read by Hoogerwerf at Bogor and its ideas used by him without my authorisation (Hoogerwerf 1949a: 3). The manuscript was among the papers recovered from the museum by my brother in April 1947.

Moreover, in Hoogerwerf's archives donated to the Zoological Museum Amsterdam by his widow, a manuscript by the German ornithologist August Spennemann was found, along with a 64-page typescript signed by my brother Rudolf and myself concerning breeding months, egg acquisitions, nest descriptions, etc., of Javan birds. Both documents had gone missing from the Bogor museum during the war. The Amsterdam museum returned a copy of this manuscript to me and, some years later, also the original.

Incorrect information in other publications

In 1950 two papers in Dutch by Hoogerwerf (1950a,b) described the biology and nesting of birds in the Botanical Gardens of Cibodas on Mt. Gede and in the Botanical Gardens at Bogor. Because many eggs in Hoogerwerf's collection were not his own, he often possessed few data on nesting habits and nest descriptions. The accounts in his publications are therefore often rather general, very unspecific, and sometimes plain wrong, as when he described the nest of Mountain Tailorbird *Orthotomus cuculatus* as like that of other tailorbirds: ['the nest is like that of a tailorbird (*Orthotomus*), but mainly composed of green moss, mixed with much seed down'] (Hoogerwerf 1950a: 111). In fact the nest of Mountain Tailorbird differs markedly from other tailorbirds, it being a dome-shaped structure with a side entrance exclusively composed of dry rattan or bamboo leaves, and usually placed in the fork of a small subcanopy sapling in primary forest (*cf.* Fig. 11). Although Hoogerwerf described and depicted the eggs of this tailorbird (1949a, Plate XVII.17, Fig. 239), there are no eggs of this species in his collection.

Moreover, Hoogerwerf ignored earlier publications by other authors when he claimed to have discovered species such as Rufous Night Heron *Nycticorax caledonicus*, Glossy Ibis *Plegadis falcinellus* and Beach Stone Curlew *Esacus magnirostris* breeding on Java for the first time: 'all these species were not known as breeding birds of Java at the time that the Bartels collection was obtained' (Hoogerwerf *in* Hellebrekers & Hoogerwerf, 1967: 6). However, they had already been recorded as breeding on Java by Bartels & Stresemann (1929).

Similarly, the occurrence of *Nycticorax caledonicus* on Java had already been reported by Schoenmakers (1933), the then director of the Zoological Gardens at Surabaya (East Java). The 'rediscovery' by Hoogerwerf (1949b) of the eggs of the Javanese race of Common Coot *Fulica atra lugubris* at the Bogor museum is also an overstatement, as these two eggs, when I saw them in 1941–42, had been very neatly labelled by P. F. Franck, former taxidermist at the museum with: '[May 1937, Lake Taman Hidup (1968 m), Yang Highlands (Plateau), E. Java, leg. Mr. J. H. ten Cate, donation Mr. A. J. M. Ledeboer]' (Ledeboer being at that time owner of the Yang Highlands area). Moreover Hoogerwerf (1949b: 55–56) stated that he had examined only two eggs of the Javanese race of the Common Coot, but illustrated six (Hoogerwerf 1949b, Plate V, Fig. 42).

Discussion and conclusions

The information presented above clearly demonstrates that Hoogerwerf impoverished other oological collections from Java to enrich his own, especially the Bartels collection but also the Bouma and Becking collections. The examples given are far from exhaustive. The missing clutches are almost all of the rarer or more difficult-to-obtain species. Thirteen species originally represented in the Bartels egg collection were no longer in that collection at the time of its acquisition by RMNH. These are: Bronze-winged Jacana *Metopidius indicus*, White-headed Stilt *Himantopus leucocephalus*, Wreathed Hornbill *Rhyticeros undulatus*, Asian Pied Hornbill *Anthracoceros albirostris*, Rufous Woodpecker *Celeus brachyurus*, White-bellied Woodpecker *Dryocopus javensis*, Straw-headed Bulbul *Pycnonotus zeylanicus*, Black-headed Bulbul *P. melanicterus*, Cream-vented Bulbul *P. simplex*, Olive-winged Bulbul *P. plumosus*, Yellow-bellied Warbler *Abroscopus superciliaris*, Plain Flowerpecker *Dicaeum concolor* and Crimson Sunbird *Aethopyga siparaja*. At the request of L. D. Brongersma, in 1970 I prepared a near-complete list of all clutches that had disappeared from the original Bartels collection near the end of the Pacific war (March 1944), after it was evacuated to the Bogor museum. This document should still be available in RMNH.

For the P. J. Bouma collection a similar list could be made. From the taxonomically arranged Becking collection all the Accipitridae and Falconidae eggs disappeared while the collection was in Bogor, when Hoogerwerf was present in the Bird Division. A number of these raptor eggs were included and figured in Hoogerwerf (1949a). Hoogerwerf must have taken at least some of these eggs with him to the Netherlands, because his 1967 publication mentioned their weights, and implied that they belonged to his own collection. His 1949a publication did not mention any such egg weights. These eggs were, however, missing from his collection after his death. He probably destroyed them to eliminate incriminating evidence.

As already briefly mentioned, I also lost a great number of my notebooks and manuscripts at the Bogor museum during the Japanese occupation. I was fortunate that a number were kept at another location and thus survived the war. To my great surprise, in May 2005, I was informed by Dr S. (Bas) van Balen that a 64-page manuscript, clearly signed by my brother and myself, had been discovered among Hoogerwerf's papers, as given to Dr P. J. H. van Bree of the Zoological Museum Amsterdam by Hoogerwerf's widow, shortly after Hoogerwerf's death in 1977. It was wrapped within a manuscript of the German field ornithologist August W. Spennemann containing field observations of a number of Javanese birds, including Javan Lapwing *Vanellus macropterus*. This manuscript had been part of my papers stored at the Bogor museum during the war, from where it had gone missing. This discovery was all the more surprising as M. J. van Steenis-Krusemann, widow of Prof. C. G. G. J. van Steenis, botanist and founder of the Flora Malesiana, who also lived in Bogor during the war, wrote that all Hoogerwerf's papers had been burnt posthumously by his widow (van Steenis-Krusemann 1988: 36).

Finally, Hoogerwerf's private egg collection has an unnatural, unbalanced species composition. Common species are poorly represented or even absent, whereas rare species are over-represented. Eggs of such (at the time) common species as Linchi Swiftlet *Collocalia linchi*, Blue-eared Kingfisher *Alcedo meninting*, Coppersmith Barbet *Megalaima haemacephala*, Brown-capped Woodpecker *Dendrocopos moluccensis*, White-headed Munia *Lonchura maja*, Java Sparrow *Pada oryzivora* and Asian Glossy Starling *Aplonis panayensis* are completely lacking. The very common sunbird Brown-throated Sunbird *Anthreptes malacensis* is represented by only one clutch, whereas a number of clutches of the rare species (e.g. Ruby-cheeked Sunbird *Anthreptes singalensis*) are present. There is no clutch of the very common Brown-capped Woodpecker *Dendrocopos moluccensis*, but the collection does contain eggs of extremely rare woodpeckers such as Rufous Woodpecker *Celeus brachyurus* and White-bellied Woodpecker *Dryocopus javensis*. I can only conclude that, at the time of his main oological article (Hoogerwerf 1949a), Hoogerwerf had no private egg collection worth speaking of, and he primarily assembled eggs from the three collections present in the Bogor museum while he was there: the Bartels, Bouma and Becking collections.

Although Hellebrekers & Hoogerwerf (1967) purported to describe the eggs from two different collections, i.e. the Bartels collection and Hoogerwerf 's private collection, their concern for the main part is the same collection, i.e. the Bartels collection. To make this plausible, a large amount of information on dates and localities was falsified by Hoogerwerf. I have found no evidence that Hellebrekers knew of this, and do not believe that he did. However, it is my considered opinion that all oological and nesting information published by, or together with, or based on, Hoogerwerf, needs checking. Moreover, this means that information derived from his publications and used to indicate the ranges and breeding seasons of Javanese birds is unreliable. Thus, for example, certain species accounts in Collar *et al.* (2001), notably that on Javan Lapwing *Vanellus macropterus*, require reworking.

In this connection it is worth referring to Mees (1986) for exposure of an early example of 'photo-shopping' (i.e. photographic manipulation) by Hoogerwerf (1965) in his attempt to find acceptance for a new subspecies of *Pycnonotus plumosus*, i.e. *P. p. sibergi*. Mees (1996), discussing the geographic variation of some birds of Java, also demonstrated that the subspecies *Aegithina tiphia djungkulanensis* described by Hoogerwerf (1962) is in fact identical to the Sumatran subspecies *horizoptera*. Many other subspecies described by Hoogerwerf should probably also be reassessed.

Mees (2006: 6–7) listed eight bird species reported by Hoogerwerf (1954, 1956) from the western islands of Flores (Komodo, Padar and Rinca), which are, according to him, unknown from this region and whose records are very questionable. Finally, Hoogerwerf (1939, 1970) published photographs of a living Javan Tiger *Panthera tigris* taken in the Ujung Kulon nature reserve, West Java. Both Dr Max Bartels and I were intrigued by these pictures, as they look somewhat abnormal for a Javan Tiger, and independently came to the conclusion that the stripes on the tiger's coat in these pictures had been added using pen and ink.

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Taxonomic status of the Degodi Lark *Mirafra degodiensis*, with notes on the voice of Gillett's Lark *M. gilletti*

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Summary.—When first described, from two specimens taken at Bogol Manyo (='Bogol Mayo') in south-east Ethiopia in 1971, the Degodi Lark *Mirafra degodiensis* was considered a sibling species of the Horn of Africa's Gillett's Lark *M. gilletti*. However, subsequent field reports have failed to clarify how the two taxa can be separated. In order to evaluate the differences between Degodi Lark and Gillett's Lark we measured the two Degodi specimens (plus one we caught ourselves) and 43 Gillett's, reviewed the literature on the subject to assemble all the published diagnostic characters, and visited Bogol Manyo and adjacent areas to photograph, observe and sound-record both taxa. We find that there is no morphometric disjunction between the taxa, no evidence of vocal separation, no consistent plumage difference, and no molecular distinction. We therefore regard *M. degodiensis* as most probably a synonym of *M. gilletti*; if it is retained as a subspecies of *gilletti* it must be chiefly on account of its smaller mean size.

The Degodi Lark *Mirafra degodiensis* was described on the basis of two specimens collected at Bogol Manyo (='Bogol Mayo'), eastern Ethiopia, in November 1971 (Erard 1975 [apparently only published in 1976, *fide* R. J. Dowsett *in litt.* 2008]). These specimens closely resembled Gillett's Lark *M. gilletti* but were distinguished mainly on the basis of their shorter tails, and also of distinctive combinations of certain other mensural variables; the describer was inclined to consider them as meriting only subspecific status but, on the recommendation of C. Vaurie in the light of their seeming parapatric relationship to populations of Gillett's Lark, he elected to treat them as a sibling species of Gillett's (Erard 1975; C. Erard pers. comm. 2007 and *in litt.* 2008). Since that time the species has been found nowhere else and has therefore been listed as at risk (current IUCN status Vulnerable) owing principally to its highly restricted range (Collar & Stuart 1985, Stattersfield & Capper 2000, BirdLife International 2008); in turn, this small range has been crucial in the identification of the pastoral bushlands around Bogol Manyo as an Important Bird Area (EWNHS 1996, 2001).

However, only a few observers have made their way so far east in Ethiopia to investigate the species, and none has sought to survey it in order to determine the true limits of its distribution and therefore its more exact conservation status. Moreover, those few that have made the journey—Ash & Gullick (1990), Webb & Smith (1996), Francis & Shirihai (1999), N. Borrow (*in litt.* 2007)—are by no means uniformly confident or clear over the identification of the species. Consequently the task of attempting a survey of its range and conservation status remains problematic, and the value of such work questionable. Prompted in particular by the doubts of N. Borrow (*in litt.* 2007 and to J. S. Ash in 2006), we assembled the sparse literature on the Degodi Lark and Gillett's Lark, listed out the characters offered by various observers as certainly or possibly diagnostic of the former, and set them against our own evidence gathered during a two-night visit to Bogol Manyo (18–19 June 2007; 04°31′N, 41°32′E) and adjacent areas along the road from Filtu (05°07′N, 40°39′E) to beyond Cole (05°25′N, 41°49′E), where we sought to find, photograph and sound-record

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Taxonomic status of the Degodi Lark *Mirafra degodiensis*, with notes on the voice of Gillett's Lark *M. gilletti*

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Summary.—When first described, from two specimens taken at Bogol Manyo (='Bogol Mayo') in south-east Ethiopia in 1971, the Degodi Lark *Mirafra degodiensis* was considered a sibling species of the Horn of Africa's Gillett's Lark *M. gilletti*. However, subsequent field reports have failed to clarify how the two taxa can be separated. In order to evaluate the differences between Degodi Lark and Gillett's Lark we measured the two Degodi specimens (plus one we caught ourselves) and 43 Gillett's, reviewed the literature on the subject to assemble all the published diagnostic characters, and visited Bogol Manyo and adjacent areas to photograph, observe and sound-record both taxa. We find that there is no morphometric disjunction between the taxa, no evidence of vocal separation, no consistent plumage difference, and no molecular distinction. We therefore regard *M. degodiensis* as most probably a synonym of *M. gilletti*; if it is retained as a subspecies of *gilletti* it must be chiefly on account of its smaller mean size.

The Degodi Lark *Mirafra degodiensis* was described on the basis of two specimens collected at Bogol Manyo (='Bogol Mayo'), eastern Ethiopia, in November 1971 (Erard 1975 [apparently only published in 1976, *fide* R. J. Dowsett *in litt.* 2008]). These specimens closely resembled Gillett's Lark *M. gilletti* but were distinguished mainly on the basis of their shorter tails, and also of distinctive combinations of certain other mensural variables; the describer was inclined to consider them as meriting only subspecific status but, on the recommendation of C. Vaurie in the light of their seeming parapatric relationship to populations of Gillett's Lark, he elected to treat them as a sibling species of Gillett's (Erard 1975; C. Erard pers. comm. 2007 and *in litt.* 2008). Since that time the species has been found nowhere else and has therefore been listed as at risk (current IUCN status Vulnerable) owing principally to its highly restricted range (Collar & Stuart 1985, Stattersfield & Capper 2000, BirdLife International 2008); in turn, this small range has been crucial in the identification of the pastoral bushlands around Bogol Manyo as an Important Bird Area (EWNHS 1996, 2001).

However, only a few observers have made their way so far east in Ethiopia to investigate the species, and none has sought to survey it in order to determine the true limits of its distribution and therefore its more exact conservation status. Moreover, those few that have made the journey—Ash & Gullick (1990), Webb & Smith (1996), Francis & Shirihai (1999), N. Borrow (*in litt.* 2007)—are by no means uniformly confident or clear over the identification of the species. Consequently the task of attempting a survey of its range and conservation status remains problematic, and the value of such work questionable. Prompted in particular by the doubts of N. Borrow (*in litt.* 2007 and to J. S. Ash in 2006), we assembled the sparse literature on the Degodi Lark and Gillett's Lark, listed out the characters offered by various observers as certainly or possibly diagnostic of the former, and set them against our own evidence gathered during a two-night visit to Bogol Manyo (18–19 June 2007; 04°31′N, 41°32′E) and adjacent areas along the road from Filtu (05°07′N, 40°39′E) to beyond Cole (05°25′N, 41°49′E), where we sought to find, photograph and sound-record a sample of birds representative both of *M. degodiensis* and of *M. gilletti*, and to capture a specimen of *M. degodiensis*. We also examined and measured the only material of *M. degodiensis* (*n*=2) and the combined series of *M. gilletti* (*n*=43) held in the American Museum of Natural History, New York (AMNH) (16 specimens), Natural History Museum, UK (BMNH) (21), Los Angeles County Museum (LACM) (1), Muséum National d'Histoire Naturelle, Paris (MNHN) (2) and National Museum of Natural History, Washington DC (USNM) (3), and we sought further information and clarification from previous observers at Bogol Manyo, namely John S. Ash, Nik Borrow and Christian Erard himself.

Records, range and habitat of the Degodi Lark

Records of birds judged or assumed to be Degodi Lark come from a very limited area, extending from 17 km west of Bogol Manyo (Webb & Smith 1996) to the Cole area, 25 km south-east of Bogol Manyo (C. Hillman & MNG unpubl. data), and comprise these outliers plus Bogol Manyo village itself (N. Borrow & MNG unpubl. data), the type locality 11 km east of Bogol Manyo (Erard 1975, Ash & Gullick 1990, Hornbuckle *et al*. 1996; pers. obs.), and points 15 km and 17 km east of Bogol Manyo (EWNHS 2001). Thus the species is known, so far as we are aware, from six localities extending over 42 km along the Filtu–Dollo road (see Fig. 1) and over an altitudinal range of *c*.200–400 m.

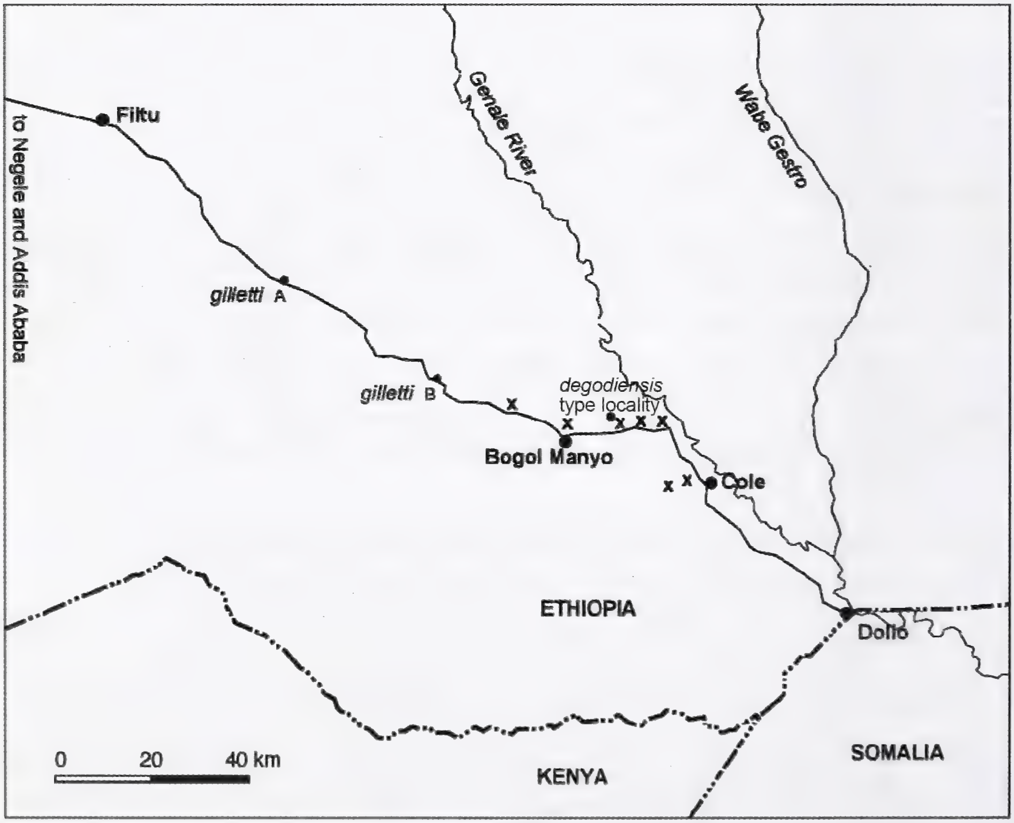

Figure 1. Map of the lower Genale region showing range of Degodi Lark *Mirafra degodiensis* (crosses represent sites from which the taxon has been reported: see text), with localities A and B where in 2007 we encountered Gillett's Larks *M. gilletti*.

We focused our own field work at the type locality to be certain that the birds we sought would unequivocally be attributable to *M. degodiensis*. At this site, a rectangle of 7 ha centred on *c*.04°32′N, 41°37′E (326 m), on 18 June 2007 we encountered three calling individuals and heard several (probably at least three) more on the north side of the Bogol Manyo–Dollo road between 06.30 h and 08.30 h, over a linear distance of 520 m (individual birds being separated by 250 and 320 m). The impression from this short encounter was that the species must be common in the area. Indeed, the following morning we located two more calling birds on separate territories, within five minutes of walking south of the road, from the same starting point and in the same early morning time-frame. We made minidisc recordings (Sony MZ-RH1 recorder with a Sennheiser MKE300 microphone) of calls and/or songs of five individuals, photographed three of these plus the presumed mate of one of them, and mist-netted one.

Erard (1975) reported that his specimens of Degodi Lark were collected in (our translation) 'a very light brush with low bushy acacias on bare soil'. At what they assumed to be the same locality Ash & Gullick (1990) found birds in 'thin low acacias 3–4 m high with scattered *Commiphora* and other bush species' but without 'any low vegetative ground cover anywhere'. Again, at what we in turn assumed to be the same locality we found habitat to consist of stunted open thorny *Acacia–Commiphora* scrub with scattered deciduous and evergreen trees, 3–5 m high, with open patches and clearings of low herbs, grasses and small woody shrubs, on a very stony substrate of pale red-brown soil. Quantities of livestock grazed and browsed the area, notably camels and goats.

Records, range and habitat of Gillett's Lark

Gillett's Lark is endemic to the Horn of Africa, ranging from eastern Ethiopia just south of the Djibouti border to the three-way intersection of the frontiers between Ethiopia, Kenya and Somalia, with a small presence in north-east Kenya and a range in Somalia north of 02°N which only excludes the north-east coastal regions either side of the 'horn' itself (Erard 1975, Dean *et al*. 1992, Ryan 2004). More precisely, both Erard (1975) and Ash & Miskell (1998) mapped the distribution of Gillett's Lark in Somalia and showed the species as being recorded at and to the south of Dollo, around 50 km east of Bogol Manyo (04°31′N, 41°32′E in the *Times comprehensive atlas of the world* 1999). Moreover, Miskell & Ash (1985) indicated Gillett's Lark as being recorded in north-east Kenya from localities immediately due south of Bogol Manyo, e.g. Handotu at 03°57′N, 41°53′E and Sarigo at 03°43′N, 41°30′E, and, extrapolating from the Ethiopian evidence and habitat/rainfall evidence, Lewis & Pomeroy (1989) suggested that the species might extend west in Kenya as far as Moyale. Whether or not this is demonstrated, it is already clear that Gillett's Lark flanks the range of Degodi Lark to the north-west, north, east, south and south-southwest.

During our drive to Bogol Manyo from Filtu (17 June 2007), and on our return two days later, we stopped and searched for Gillett's Larks at regular intervals, although the time of day was never favourable and the stage in the breeding cycle appeared to be more advanced than at Bogol Manyo itself (see below), such that the species proved somewhat elusive. However, we found an individual calling at 04°49′N, 41°00′E (802 m), and another only 35 km north-east of Bogol Manyo (822 m), at 04°37′24″N, 41°17′32″E. (According to N. Borrow [pers. comm. 2007], Gillett's Larks prove to be very common all along this road earlier in the year, during or following rain.)

The habitat of Gillett's Lark has been described as 'open scrub savanna on sand and on hard stony soils, and . . . sparse thorny scrub and aloe scrub on edges of rocky outcrops, 1000–1500 m' (Dean *et al*. 1992) and as 'semi-arid savanna and scrub, typically on hard substrates, often near rocky areas . . . [in Somalia in areas receiving 75–450 mm annual rainfall] . . . from near sea-level to 1500 m' (Ryan 2004). Erard (1975), after outlining earlier accounts which mentioned light savanna with low thorny bushes and perhaps a preference for richer hill vegetation, observed birds in (our translation) 'light woody savanna with scattered large acacias dominating a discontinuous bushy stratum intersected by grassy patches on sandy soil'. Our own encounters with Gillett's Larks were in fairly dense to semi-open but heavily grazed thorn-bush (penetrable along myriad cattle-paths), with many trees at least 5 m high and bushy vegetation generally 3–4 m high, the birds themselves feeding frequently in patches of short grass at the base of cover and flying up onto the outer branches of bushes.

Morphology

Characters judged or suspected to distinguish Degodi Lark from Gillett's Lark have been published by Erard (1975), Ash & Gullick (1990), Dean *et al.* (1992), Francis & Shirihai (1999; also Shirihai & Francis 1999), Vivero Pol (2001), Sinclair & Ryan (2003) and Ryan (2004). These are listed and dealt with in turn below, but obvious handbook repetitions of characters are not cited.

1. *Smaller* (Erard 1975, Ash & Gullick 1990). It is certainly the case that the specimen material appears considerably smaller (see Fig. 12), but we cannot find evidence that proves that this is a real condition. Mensural data for Degodi Lark derive from only three specimens (type, paratype and our live specimen) and appear at the smaller end of the spectrum for Gillett's, but there is much overlap (Table 1).

2. *Shorter tailed* (Erard 1975). This was the single most striking feature of the type material and the one apparently most instrumental in persuading Erard to erect *degodiensis* as a full species ('Le caractère distinctif réside dans la remarquable brièveté relative des rectrices'). However, neither Ash & Gullick (1990) nor Webb & Smith (1996) were able to gauge this feature, the former authors writing that 'the tail did not appear to be inordinately short' and the latter going so far as to 'concur with Ash and Gullick that, contrary to Erard's original description . . . , the bird *appears longtailed in the field*' (our italics). As a result, its 'long-tailed' appearance (Vivero Pol 2001) and 'longish tail' (Sinclair & Ryan 2003) have now, paradoxically, been incorporated into the diagnostic literature. Moreover, re-measurement of the type material (by NJC), combined with measurement of a topotypical live bird (see below), suggests that while the three tails in question are at the shorter end of the spectrum, the complete disjunction indicated in Erard (1975) is not borne out; indeed, a specimen of *gilletti* in AMNH (556934) proved to have a tail 1 mm shorter than the shorter of the two tails of *degodiensis* (Table 1).

3. *Duller and more uniform* (Ash & Gullick 1990). We were unable to detect any such difference, and to some extent this notion is contradicted by differences 4, 5 and 10

TABLE 1

Measurements of *M. degodiensis* and *M. gilletti*. All measurements are in mm and expressed as means ± SE (range). They were made from museum specimens, as follows: AMNH 16, BMNH 21, LACM 1, MNHN 4 (including 2 *degodiensis*), USNM 3, plus a live specimen from the type locality of *degodiensis*. For explanation of museum acronyms, see Introduction.

Taxon	*N*	Bill	Tarsus	Wing	Tail
M. degodiensis	3	15.0 ± 1.2 (13–17)	22.3 ± 0.3 (22–23)	77.0 ± 1.5 (74–79)	59.0 ± 1.0 (57–60)
M. gilletti	43	16.9 ± 0.2 (13–19)	22.4±0.1 (21–24)	82.3 ± 0.5 (76–91)	62.1 ± 0.4 (56–70)

below. Comparison of birds in all the plates reveals no evidence of greater dullness and uniformity in Degodi, and if there is variation in plumage it is probably a seasonal and/or individual rather than a taxonomic character.

4. *Distinctly paler overall* (Francis & Shirihai 1999). We found no clear evidence of this (see Figs. 5–12).
5. *Paler and more rufous above* (Erard 1975). There is a small degree of individual variation in upperpart coloration, but there is overlap with Gillett's and it is emphatically not a 100% diagnostic character. Arguably this contradicts character 3 above, and reinforces the idea that such differences may depend on wear and/or individual variation.
6. *Streaking above finer and less dense* (Erard 1975), mis-repeated as 'narrower and denser' by Dean *et al.* (1992). This does not hold either on specimens or in photographs (see Figs. 5, 9–11).
7. *Breast less heavily marked (more speckled than streaked; more finely streaked, less blotchy spotting; more camel-coloured and obsolete—by implication darker and stronger in Gillett's)* (Erard 1975, Francis & Shirihai 1999). The breasts of the type material from Bogol Manyo might seem less powerfully marked, but the difference is very minor and is certainly not 100% reliable; indeed, two *gilletti* from one locality in northern Somalia (BMNH 1908.5.28.115–116) show a similar reduction, which may reflect local or individual variation of a trivial nature (Figs. 5–8, 10–12, 14–15).
8. *Breast streaking stops at carpal level, not extending onto lower breast* (Francis & Shirihai 1999). Such a subtle difference may simply be an effect of the angle at which the bird is perched, and we certainly could not confirm it in the field (Figs. 5–8, 10–12). In BMNH, however, it is apparent that breast streaking is moderately variable in both extent and strength (see, e.g., Figs. 14–15) such that this character must be regarded as invalid.
9. *Pale collar more pronounced* (C. Erard *in* Ash & Gullick 1990). Our live specimen in the hand showed no more pallor around the hindcollar than our photographs of *gilletti* (Figs. 5, 9–11).
10. *Scapulars black-centred and broadly fringed, forming prominent scaly pattern (brown-centred and narrower fringed in Gillett's, forming indistinct pattern)* (Francis & Shirihai 1999). If anything, the photographic evidence (Figs. 5, 9–11) tends to indicate the opposite, suggesting that this character is variable within populations and/or annual cycle.
11. *Sometimes with small, ill-defined darkish breast-side patches (never in Gillett's)* (Francis & Shirihai 1999). We saw no Degodi Larks that showed this feature, which is simply the running-together of a few breast streaks, except for the bird in the hand when its carpal was lifted. We saw no Gillett's which showed this character either, but there are two specimens of Gillett's in BMNH (1906.12.3.69 and 1923.8.7.2639) in which such a dark breast-side mark occurs (Fig. 13); moreover, one of the two specimens of *gilletti* in Paris (MNHN 1976.561) also shows dark breast-side patches (Fig. 12). Thus this character, which in any case (not being 100% diagnostic) must be counted both unreliable and trivial, is in fact invalid.
12. *Moustachial and malar stripes narrower, fainter and buffish-brown (fairly bold and blackish in Gillett's)* (Francis & Shirihai 1999). This is by no means clear-cut and certainly not 100% diagnostic (Figs. 5–11, 13–15). In BMNH, specimens of *arorihensis* are browner and fainter than those of nominate *gilletti*, and despite the map in Erard (1975) it is unknown

how close *arorihensis* approaches Bogol Manyo from the east and south. At any rate, the moustachial and malar markings of Degodi Lark and *M. g. arorihensis* are extremely similar.

13. *Very narrow pre-ocular eyestripe, more diffuse and paler (grey-brown) behind eye (post-ocular) (broader and blacker along length in Gillett's)* (Francis & Shirihai 1999). Photographs (Figs. 5–11) suggest that this is a variable condition (the Degodi in Fig. 8 seems to have at least as strong a supercilium as the Gillett's in Fig. 11), very difficult to gauge and improbably valid. Specimens are not particularly helpful, and this feature is at best only a possible minor point of divergence.

Description of a live individual

On 19 June at around 08.00 h, at 04°31′N, 41°37′E, 318 m (and as we believe within 500 m of the site at which Erard obtained the holotype), a bird was captured in a mist-net by playback of its own alarm-calls which, as we subsequently discovered, appeared to be given in response to the accidental threat we were perceived to present to at least one just-fledged and still completely dependent young. The captured bird had a fully ossified skull and showed no evidence of moult; it possessed a fairly strong cloacal protuberance, suggesting it was male (as molecular analysis later proved) but an old brood-patch was possibly present; bill from skull was 15 mm; wing 78 mm curved, 82 mm flat; tail 60 mm; tarsus 23 mm; weight 19.2 g.

Plumage.—Crown rufous-tinged sandy brown with faint darker brown streaks and pale buffy margins, nape and hindcollar mid brown with pale buffy edges forming slightly paler collar effect (only visible when head held up), mantle and back fairly dark brown with pale brown inner margins and buffy fringes, scapulars plain brown with darker brown centres and buffy fringes, wing-coverts plain brown with buffy-whitish edges, remiges and rectrices brown. Supercilium broad buff; eyestripe dark brown (loral line blackish brown, post-ocular line brownish), ear-coverts rufous-tinged sandy brown, lower lores buff, subocular line buff, moustachial line thin, vague and blackish, submoustachial area creamy whitish, malar line vague and brownish, chin and upper throat creamy whitish, breast lightly streaked rufous-tinged sandy brown, with vague darker central lines to some streaks, darker and broader at breast-sides (but this was only visible in the hand when the wing was raised), remaining underparts dirty whitish. *Bare parts*: irides pale brown, legs pink, upper mandible blackish, lower mandible pale grey with a blackish tip.

The bird was sampled for blood (deposited at the Zoological Museum, Copenhagen), photographed (see Figs. 5–6), and released at the place of capture.

Behaviour and voice

During their February visit, Ash & Gullick (1990) took 7.5 hours of searching before they found any birds, which then proved very quiet and secretive; they speculated that this might be a behavioural difference between Degodi and Gillett's Larks. However, we suspect that this simply reflected season and is not a species-specific behaviour. During our June visit, we found Degodi Larks singing very conspicuously (and on both mornings it took us only a few minutes to find them), whereas by contrast it was then the Gillett's Larks, at higher elevations farther north-west where the rain falls earlier (February–April in the Filtu area, *vs.* start of April at Bogol Manyo: MNG pers. data), that were quiet, giving only calls and no songs, and were shy and relatively difficult to find.

Accounts of the voice of Gillett's and Degodi Lark are heavily compromised by the fragmentary nature of the reports, the individual manner of both description and transcription, and the interpretation placed on them all by the observers and subsequent compilers.

Literature on Gillett's Lark.—Dean *et al*. (1992) gave the song as a 'dsee-dsit' (reported by J. S. Ash) and as 'sisisidetio' and 'da-di-da-di-da-di-da' (reported by Erlanger). Sinclair & Ryan (2003) mentioned a 'jumbled, chirpy song similar to Foxy Lark's [*Mirafra* (*Calendulauda*) *alopex*] but with more "chissik" notes'. Ryan (2004), making no reference to Sinclair & Ryan, reinterpreted Dean *et al*.'s information so as to treat the 'dsee-dsit' more as a call, while mentioning a 'longer song in aerial display'.

Literature on Degodi Lark.—Dean *et al*. (1992) had no information on the voice of Degodi Lark. Webb & Smith (1996) were the first to fill the void, giving its call as a 'high-pitched *tsee-tsee*, the first note ascending in pitch, the latter descending', and, when this call was played back to the caller, it quickly began 'calling or singing' with 'a 4–6 note high-pitched trill, *twill-ill-ill-ill-it* slightly reminiscent of Wood Warbler *Phylloscopus sibilatrix*', the whole vocalisation being lower pitched than the call and even-pitched throughout. Shirihai & Francis (1999) heard birds sing without providing a description, but they mentioned the call as a high-pitched '*tzik*'. Sinclair & Ryan (2003) referred to the Degodi Lark as having a 'distinctive song', but then simply repeated the two vocalisations described by Webb & Smith (1996); their use of the word 'distinctive' is therefore misleading, since they could only have been referring to Webb & Smith's second vocalisation, which involved no comparisons with Gillett's Lark and supplied no evidence of its diagnostic value. Ryan (2004) reported Webb & Smith's two calls, but added that the species is 'also reported as uttering repeated sibilant trill . . . with occasional notes similar to those of *M. gilletti*'; the source of this last vocalisation is not apparent from the literature cited by Ryan (2004). Most tellingly, but without any attempt at a description, Hornbuckle *et al*. (1996) reported three birds at the type locality 'singing identically to Gillett's (heard and taped previous and same day)', their localities for the nearest Gillett's being 7 km west and 20 km east of Filtu.

Recent field evidence.—At the type locality of Degodi Lark on 18 June 2007 we heard several birds calling. This mainly consisted of two high-pitched short whistles (the same as the first two notes of the song), *sii-sii*, but sometimes just a single note, *sii*, sometimes a triplet with the emphasis on the last note, *sii-sii-sí*, and sometimes as a more rapid double note, *sisi*. These all fit well with Ash's *dsee-dsit* (Gillett's) and Webb & Smith's *seee-seee*, and even Francis & Shirihai's *tzik*.

Some birds, sitting out vigilantly as if concerned for others in the vicinity, turned this call into a longer, more rolling trill, with the same timbre and pitch, *srrrrrrrii-srrrrrrrii-srrrrrrrii* (but given singly, doubly, triply or in strings). We mist-netted one of these birds by playing this sound back to it, the bird instantaneously flying towards the source. We decided it was in fact an alarm-call, in this case issued to just-fledged young, of which we saw one. The call is illustrated in Fig. 2 and, as can be seen, is precisely matched by Gillett's Lark. We are confident from their description that this is the same as Webb & Smith's *twill-ill-ill-ill-it*.

We detected our first two Degodi Larks by their song, which consisted of a short, sweet, relatively quiet and simple strophe, high-pitched, lilting and slightly descending in pitch in a way reminiscent of a Willow Warbler *Phylloscopus trochilus*, and transcribed as: *sii-sii-sii-twilly-twill-tew-tew* (which clearly corresponds with Erlanger's *sisisidetio*, as cited in Dean *et al*. 1992). These songs were sound-recorded, and samples from the two individuals are

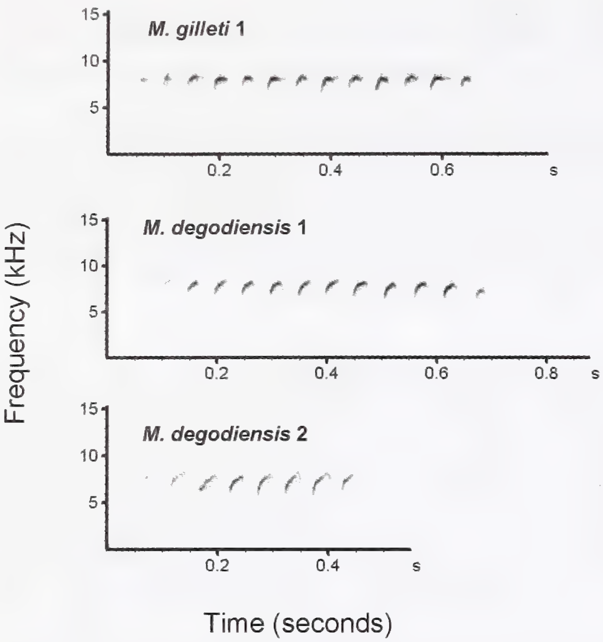

Figure 2. Sonograms of calls of Degodi Lark *Mirafra degodiensis* and Gillett's Lark *M. gilletti*. Recordings of *M. degodiensis* involve two individuals (1 and 2), both recorded 11 km east of Bogol Manyo, 19 June 2007, by CNS. The *M. gilletti* was recorded in Awash National Park, Ethiopia, 26 September 2006, by C. Cohen.

reproduced in Fig. 3, where for comparison several sonograms of Gillett's Larks from various parts of the range are presented. These illustrate the strong similarity of the songs of Degodi with those of Gillett's (notably the upper sonograms marked *M. gilletti* 1 and *M. gilletti* 2) although, as the sonograms show, the songs of Gillett's are somewhat variable (but with a clear basic pattern). In one taped example the Gillett's song is repeated several times with barely a break, rather than being a self-standing strophe, and it seems likely that more extensive sampling of birds at different times of day and year would produce more evidence of variability in song pattern. However, the key point here is that the songs we recorded of Degodi Lark sit close to or within the small span of variation reflected in our collected vocal material of Gillett's.

Recordings were digitised at a sampling rate of 44.1 kHz using Avisoft SASLabPro (Raimund Spect, Berlin, Germany) with a 16-bit acquisition sound card. Sonograms were created using a Fast Fourier Transformation size of 256 (Frame: 100%, Window: Hamming, Overlap: 50%), which led to a frequency resolution of 172 Hz and a temporal resolution of 2.9 msec.

Molecular evidence

A blood sample was obtained from the specimen of *Mirafra degodiensis* we mist-netted (see above). The Natural History Museum (BMNH), Tring, UK, kindly provided us with four toe-pad samples of *M. gilletti*, including two of each of the two known subspecies of *M. gilletti* from geographically disjunct populations within their range (*M. g. gilletti* from Hawash, Ethiopia, and Hargesia, Somalia, and *M. g. ahoriensis* from Bera and Wajit, Somalia). Sequences of three other species in the genus *Mirafra* were obtained from GenBank and used as outgroups in phylogenetic analysis (accession numbers: *M. passerina*, AY165163; *M. javanica*, DQ008520; and *M. sabota*, AY165172).

DNA extraction of the toe-pads was performed in a UV hood using a commercial kit (QiAmp, Qiagen). The entire foot skin sample that was provided to us was used in each extraction. Negative extraction controls, using the same instruments and reagents, were carried out simultaneously. DNA extraction from the blood sample was performed in a different laboratory, using a standard phenol-chloroform method (details in Dingle *et al.* 2006). PCR was performed on the blood sample and the museum samples separately to avoid contamination. First, a 674 bp section of *cyt b* was amplified from the blood sample using the primers L14996 and H15646. Cycling conditions were two minutes at 94°C, 45

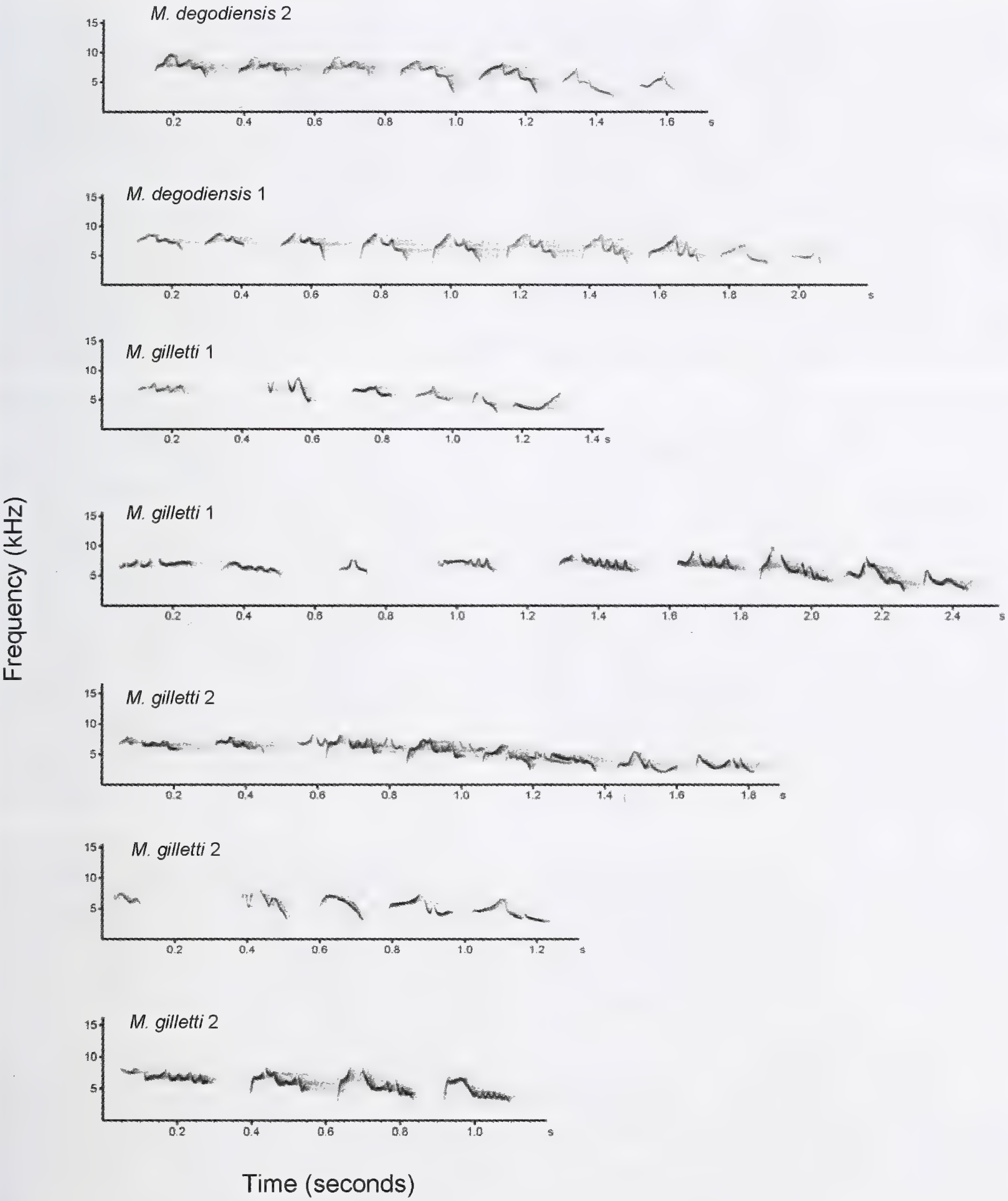

Figure 3. Sonograms of songs from Degodi Lark *Mirafra degodiensis* and Gillett's Lark *M. gilletti*. Recordings involved two individuals of each taxon (distinguished as 1 or 2). Both songs of *M. degodiensis* were recorded 11 km east of Bogol Manyo, 18 June 2007 by CNS. Both songs of *M. gilletti* were recorded in Awash National Park, Ethiopia, 26 September 2006, by C. Cohen.

cycles of 94°C for 30 seconds, 57°C for 45 seconds, and 72°C for one minute, followed by 72°C for 10 minutes. Sequencing reactions were performed using the same primers. Once sequence was obtained from the blood sample, we used the computer program Primer3 (v. 0.4.0) (Rozen & Skaletsky 2000) to design internal primers specific to the larks. These primers were cyt*b*F: GACGTCCAATTTGGCTGACT and cyt*b*R: GTGGGGTTGTCTACC-GAAAA. A 308 bp segment of the mitochondrial *cyt b* region was successfully amplified from the foot skin of three of the four specimens.

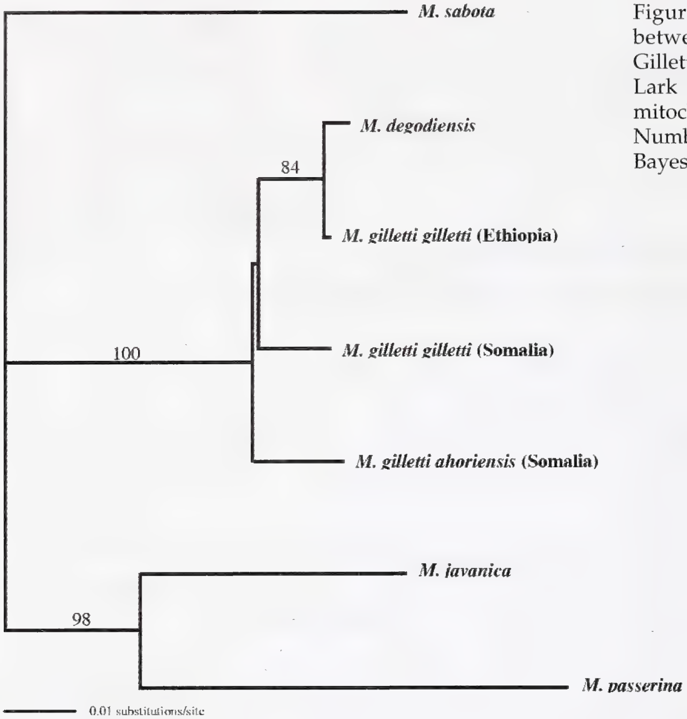
M. sabota
M. degodiensis
84
M. gilletti gilletti (Ethiopia)
100
M. gilletti gilletti (Somalia)
M. gilletti ahoriensis (Somalia)
M. javanica
98
M. passerina
0.01 substitutions/site

Figure 4. Phylogenetic relationships between haplotypes sampled from Gillett's Lark *Mirafra gilletti* and Degodi Lark *M. degodiensis* based on 308bp of mitochondrial cytochrome *b* sequence. Numbers above the branches represent Bayesian posterior probability scores.

Sequences were aligned and proofread using CodonCodeAligner (CodonCode Corporation, Dedham, MA, USA). No insertions or deletions were present, so sequence alignments were unambiguous. Phylogenetic analyses were conducted using PAUP*4.0b10 (Swofford 2002). Pairwise divergence values represent uncorrected divergences. We are confident that the present results cannot be attributed to contamination as no positive PCR results were obtained with negative extraction controls and different genotypes were obtained from different individuals.

We detected seven variable sites between the four *Mirafra* samples that we sequenced. At six of the variable sites, *M. degodiensis* shared the same allele with at least one of the *M. gilletti* sequences. Sequences from *M. degodiensis* only differed from the *M. gilletti* sequences by 1.2–1.3%, which was less than the level of divergence between the three *M. gilletti* samples (2.0–2.3%); the level of sequence divergence between the different species was significantly higher, ranging from 9.5–11.7%.

For the phylogenetic analysis, we included sequences from three other *Mirafra* species. A total of 60 nucleotide sites varied among the seven sequences, of which 31 were parsimony-informative. Phylogenetic reconstructions reveal that *M. degodiensis* is nested within the clade which includes all three *M. gilletti* individuals, indicating that the two taxa are not reciprocally monophyletic (Fig. 4).

Discussion and conclusion

Erard (1975) suggested that the variation in the abundance of certain species between Bogol Manyo and Filtu, and the shift between members of two species pairs somewhere between the two settlements, could be attributed to subtle differences in habitat, and this may indeed be the case. However, our own experience of Gillett's and Degodi Larks in 2007 suggested nothing by way of a real habitat shift. Both taxa were in areas of moderately dense vegetation where trees grew to 5 m or more, small thorn-bushes abounded and a fairly rich herb-layer, mostly consisting of grass, grew wherever the absence of cattle-tracks

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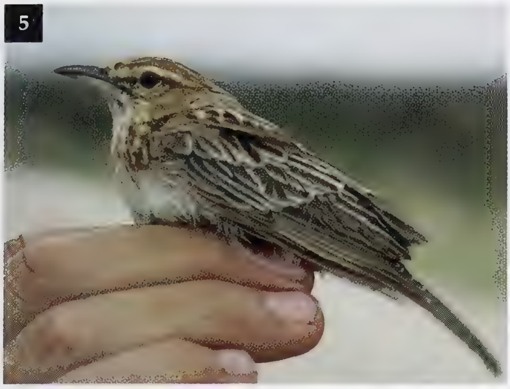

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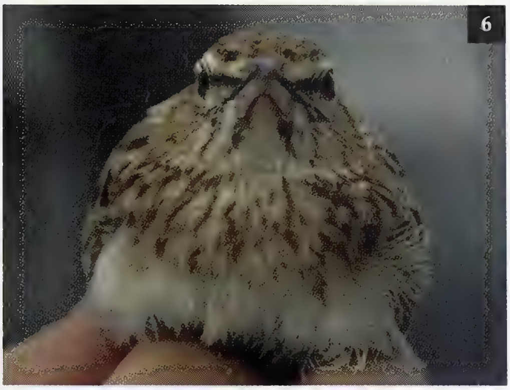

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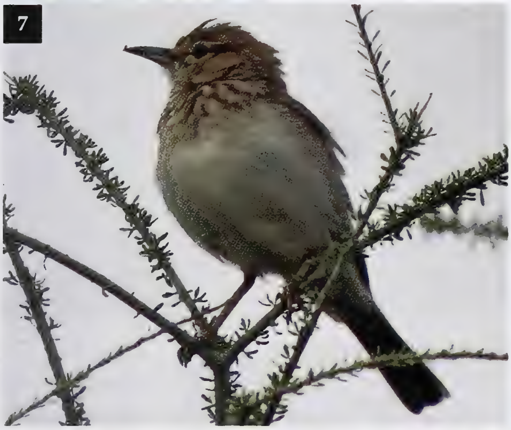

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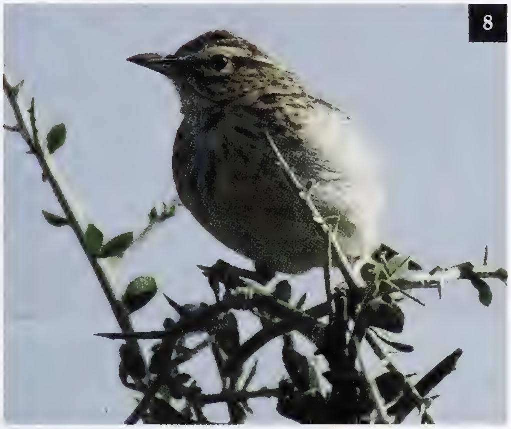

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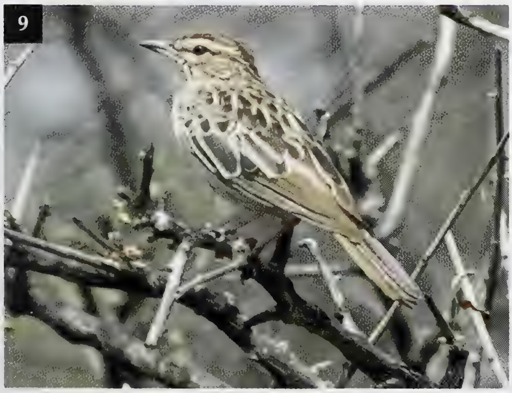

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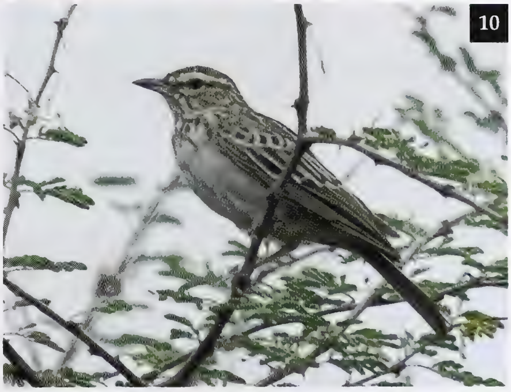

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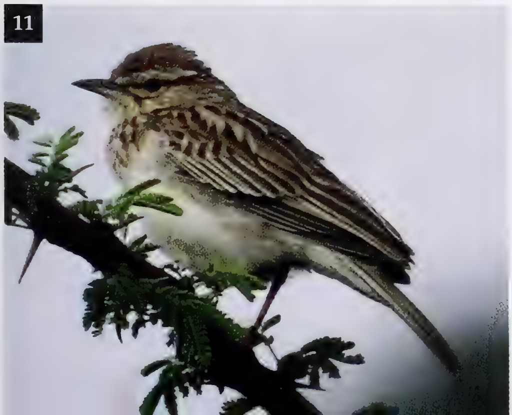

Figure 5. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, June 2007 (C. N. Spottiswoode)

Figure 6. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, June 2007; same individual as in Fig. 5 (C. N. Spottiswoode)

Figure 7. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, October 2006 (N. Borrow)

Figure 8. Degodi Lark *Mirafra degodiensis*, east of Bogol Manyo, June 2007 (C. N. Spottiswoode)

Figure 9. Gillett's Lark *Mirafra gilletti*, south-east of Filtu, June 2007 (C. N. Spottiswoode)

Figure 10. Gillett's Lark *Mirafra gilletti*, south-east of Filtu, June 2007; same individual as in Fig. 5 (C. N. Spottiswoode)

Figure 11. Gillett's Lark *Mirafra gilletti*, Awash

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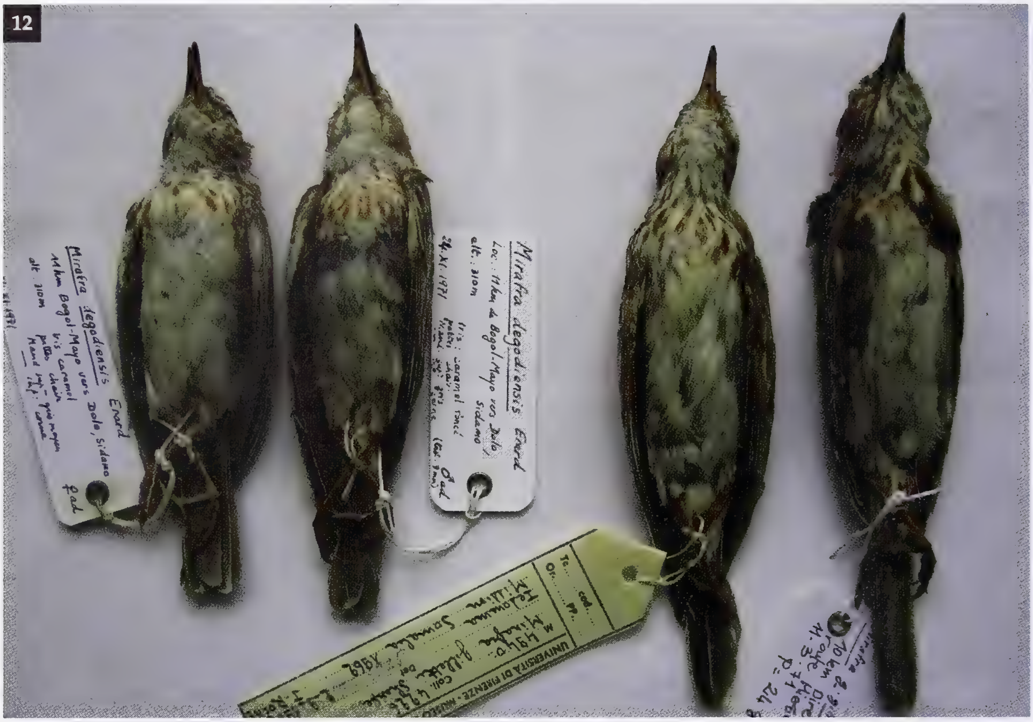
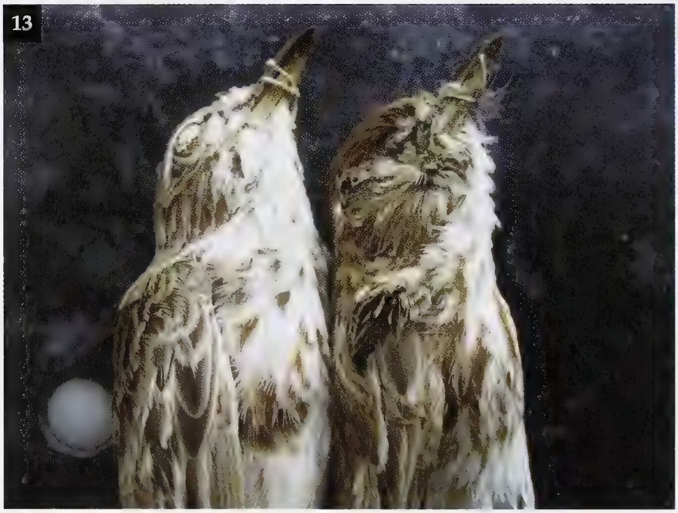

Mirafra degodiensis Erard
11km Bogol-Mayo vers Dolo, Sidamo
alt 310m
iris caramel
Mirafra degodiensis Erard
Loc.: 11km de Bogol/Mayo vers Dolo, Sidamo
alt.: 310m
iris: caramel
24.XI.1971
UNIVERSITÀ DI FIRENZE
Mirafra gilletti
Somalia 1969

13



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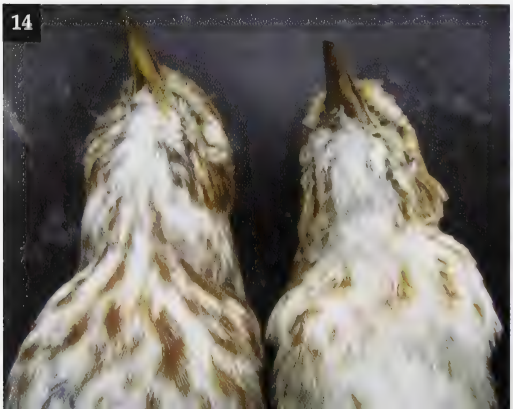

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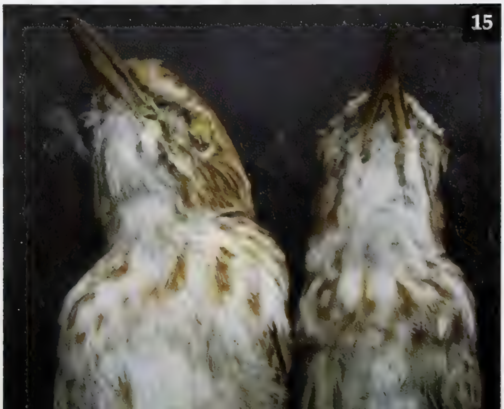

permitted. Possibly our Gillett's were in taller, denser vegetation, but this is scarcely an aid to taxonomic distinction.

Equally implausible from a taxonomic standpoint is the apparent shift in breeding regime between the Gillett's Larks higher up on the road to Filtu and the Degodi Larks in the relatively low-lying lands towards the Somali border, in which Degodi breeds rather later in the year (April–June, perhaps) than Gillett's (February–May, perhaps), reflecting different rainfall regimes between higher and lower ground. However true this may be, it is no good ground for taxonomic discrimination. In any case there must be some point of contact between the taxa along the rainfall gradient west of Bogol Manyo, and the acknowledged Gillett's to the east and south of Bogol Manyo, in Somalia and Kenya, would be on the same rainfall regime as the Degodi Lark.

There seems to be no clear and consistent morphological distinction to be made between Degodi Lark and Gillett's Lark. Degodi certainly sits at the smaller end of the mensural spectrum, with mean bill, wing and tail lengths respectively 2 mm, 5 mm and 3 mm shorter than Gillett's, but nevertheless with complete nestedness in bill and tail lengths, and the sample size is only three (Table 1). All plumage distinctions between the two appear to be based on minor individual variations or mistaken perceptions, as detailed in 'Morphology' above. A possible behavioural difference—reclusive, *vs.* obtrusive temperament—has been shown to be invalid. Vocal differences do not exist either: recordings and sonograms of these songs demonstrate Degodi Lark identical to or sitting within the relatively minor variation found in Gillett's. Finally, the mtDNA data provide no basis for phylogenetic distinction of *M. degodiensis* from *M. gilletti*, although the phylogram (Fig. 4) suggests some structure within *M. gilletti* that would bear further study.

On the basis of all this evidence we conclude that *Mirafra degodiensis* is conspecific with *M. gilletti*. This is a conclusion with which Christian Erard (pers. comm. 2007, *in litt*. 2008) concurs, having seen our evidence; he mentioned to us (NJC and CNS) that security issues were so serious at Bogol Manyo in 1971 that he was unable to stop over at the site and merely collected there on part of one day before pressing on, thereby being deprived of acquiring enough comparative material to allow him a more informed judgement. Moreover, despite the trend towards smaller size we cannot identify a single character that dependably and consistently separates the two taxa, suggesting that *M. degodiensis* may in fact be a junior synonym of nominate *M. gilletti*. However, we suggest that, for the present and provisionally, *degodiensis* is retained as a subspecies of *gilletti*, based on its mean smaller size. Nonetheless, all information provided in this paper on *M. degodiensis*, notably that on voice, therefore refers to *M. gilletti*.

Captions to figures on opposite page

Figure 12. Holotype (inner left) and paratype (outer left) of Degodi Lark *Mirafra degodiensis* next to the only two specimens of Gillett's Lark *M. gilletti* (outer right certainly nominate) in MNHN (N. J. Collar)

Figure 13. Breast-side patches in two Gillett's Larks *Mirafra gilletti* (BMNH 1923.8.7.2639 and 1906.12.3.69), a character supposed never to be present in the species (see text) (N. J. Collar, © The Natural History Museum, Tring)

Figure 14. Breast streaking on two specimens of Gillett's Lark *Mirafra gilletti ahorihensis*, showing considerable individual variation in strength and extent. Left, BMNH 98.6.13.44, male, Arabsiyo, 09°40′N, 43°46′E, November 1897; right, BMNH 1908.5.28.115, male, Eil Dab, 100 miles south-southeast of Berbera, hence roughly at Qoryale, 09°07′N, 45°57′E, December 1904. Coordinates from Ash & Miskell (1998) and *Times atlas* respectively (N. J. Collar, © The Natural History Museum, Tring)

Figure 15. Reduced breast streaking on two specimens of Gillett's Lark *Mirafra gilletti ahorihensis* (BMNH 1908.5.28.115–116) from Eil Dab, 100 miles south-southeast of Berbera, hence roughly at Qoryale (09°07′N, 45°57′E *fide Times atlas*), December 1904. Note similarity to type material of *M. degodiensis* (N. J. Collar, © The Natural History Museum, Tring)

Acknowledgements

We especially thank Christian Erard for his generous consideration of our new evidence and for his support for our conclusion, John Ash and Nik Borrow for very helpful input into the evaluation of the taxa, Nik Borrow for photographs, Callan Cohen and Jon Hornbuckle for tape-recordings, our driver Abiy Dange for his solid support, Julian Francis for drawing our attention to Hornbuckle *et al.* (1996), Nick Mundy for the use of his lab for the genetic analysis, Nick Mundy and Marie Pointer for advice on conducting the genetic analysis, Paul Sweet (AMNH), Robert Prŷs-Jones and Mark Adams (BMNH), Kimball Garrett (LACM), Eric Pasquet (MNHN) and James Dean (USNM) for access to specimens in their care, and especially Mark Adams for supplying sample toe-pads of specimens of Gillett's Lark. Bob Dowsett and Françoise Dowsett-Lemaire were very helpful referees. Funding for our field work came from the Bromley Trust, BirdLife International, Birding Africa and Julian Francis; we thank them all.

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A substitute name for *Serinus estherae orientalis* Chasen

by Ragnar Kinzelbach, Edward C. Dickinson & Soekarja Somadikarta

Received 22 September 2008

The Mountain Serin *Serinus estherae* occurs as a series of widely disjunct high-altitude isolates from the Greater Sundas to Sulawesi and the Philippines. Chasen (1940) gave the name *Serinus estherae orientalis* to the east Javan form, type locality Goenoeng Ajekajek, Tengger Mountains (08°02′S, 112°55′E), of a montane serin first discovered in western Java, which species had then very recently been discovered in northern Sumatra (Chasen 1939, Meyer de Schauensee 1939). Mees (1996) confirmed the distinctiveness of the east Javan bird from that in west Java. The relationship of Philippine *Serinus estherae mindanensis* Ripley & Rabor, 1961, to the east Javan form now merits reinvestigation.

Unfortunately, Chasen's name is a primary homonym, being preoccupied by *Serinus orientalis* Brehm, 1831, from Austria, a point overlooked for 68 years. Although Brehm's name is currently treated as a synonym of European Serin *Serinus serinus* (after Hartert 1903: 83), it is still an available name and invalidates Chasen's name under Arts. 52.2 and 57.2 of the *International code of zoological nomenclature* (ICZN 1999), as modified by Art. 23.9. We have examined Art. 23.9, which, according to Art. 57.2.1, may be used to validate in-use junior homonyms over disused senior homonyms, and have concluded that the conditions set by Art. 23.9.1.2 ('reversal of precedence') cannot be met, there being too few usages of *S. e. orientalis* Chasen in the period 1958–2007. Thus, we propose to replace it by:

Serinus estherae chaseni, nom. nov.

The new name honours Frederick Nutter Chasen (1897–1942), Director of the Raffles Museum, Singapore, from 1932 until his death, and proposer of the name we replace. The name we propose is the masculine genitive form of his name (ICZN 1999, Art. 3.1.1.2). Because *S. e. chaseni* Kinzelbach, Dickinson & Somadikarta is a replacement name for *S. e. orientalis* Chasen, its type material is the same as that for *S. e. orientalis* Chasen.

Acknowledgements

We are grateful to Mathew Louis for drawing this instance of homonymy to our attention, and to Mary LeCroy for responding to our queries about the existence of type material for Brehm's name, for kindly checking his original description and for locating at least one syntype in the American Museum of Natural History (New York). Richard Schodde kindly advised us on the need to provide a new name, despite the fact that Brehm's name has not been used as valid since perhaps before 1899, and he and David Wells provided helpful comments on our original submission.

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Volume 129 No. 2
June 2009

MEETINGS are normally held in the **Sherfield Building** of **Imperial College**, South Kensington, London SW7. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

24 November—Jeffrey Boswall—*Answering the calls of nature: an ornithological frolic with serious scientific and cultural undertones.* Jeffrey Boswall claims to be a serious amateur ornithologist but was a professional wildlife broadcasting producer for the BBC. He says this is the "climax of his world tour, positively his farewell appearance".

Applications to Hon. Secretary (address below) by **10 November 2009**

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6 October—Prof. David Goode—*Habitat change and its impact on species including avifauna.*

Applications to Hon. Secretary (address below) by **22 September 2009**

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23 June—Social evening and a series of mini-talks. Topics will include antpittas and the Araripe Manakin *Antilophia bokermanni*. Additional details will be posted on the Club's website.

Applications to Hon. Secretary (address below) by **9 June 2009**

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876995 (or e-mail: boc.sec@bou.org.uk).

Contributors See the March issue of each volume for guidelines or the BOC website Bulletin pages, at www.boc-online.org/bulletin.htm

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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

Vol. 129 No. 2 Published 13 June 2009

CLUB ANNOUNCEMENTS

It is with great sadness that we report the deaths of Mr Ian Hinze, Mr Bob Scott and Mr Steven Piper.

Members are reminded that subscriptions for 2009 were due on 1 January and are kindly asked to check that any standing orders with their banks are for the correct amount (£20 p.a.). Regrettably, several members are still paying incorrect subscription rates, causing the Club unnecessary time and expense in administration duties.

The 954th meeting of the Club was held on Tuesday 10 March 2009, in the Ante Room, Sherfield Building, Imperial College, London. Eighteen members and ten guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, S. E. CHAPMAN, Dr N. J. COLLAR, T. M. DONEGAN (*Speaker*), F. M. GAUNTLETT, D. GRIFFIN, R. H. KETTLE, R. R. LANGLEY, Dr C. F. MANN, D. J. MONTIER, Dr J. S. PRINGLE, Dr R. P. PRŶS-JONES, P. J. SELLAR, S. A. H. STATHAM, C. W. R. STOREY, M. J. WALTON and P. J. WILKINSON.

Guests attending were: Mrs C. R. CASEMENT, E. DONEGAN, Mrs K. DONEGAN, Mrs M. H. GAUNTLETT, R. GILES, Mrs M. MONTIER, J. PEARCE, Mrs C. PEARCE, Dr P. PRINGLE and J. C. VERHELST.

After dinner, Thomas Donegan gave a well-illustrated talk on *Ornithological exploration in the Colombian Andes*, which focused on the Serranía de los Yariguíes, in the East Andes. From 2003–06, he and others studied birds and other taxonomic groups of this previously unstudied and largely pristine mountain range. Photographs of many of the 546 species recorded in the mountains were shown, along with some sound-recordings.

As detailed in recent papers in the Bulletin and elsewhere, studies in Yariguíes have produced several >100 significant distributional records. In addition, various taxa new to science, such as the brush finch *Atlapetes latinuchus yariguierum*, the antpitta *Grallaricula nana hallsi* and the tapaculo *Scytalopus griseicollis gilesi* were discovered. Photographs of undescribed bird taxa in the genera *Anisognathus, Schizoeaca* and *Scytalopus* were also shown.

Thirteen threatened birds were found in Yariguíes and the surrounding foothills and lowlands, including, at the time, one of the world's largest concentrations of Critically Endangered terrestrial bird species. Several of these have been downgraded in threat category following the discovery of healthy populations in Yariguíes. Importantly, the region was declared a national park and two nature reserves have been established by ProAves in the region, which gives great hope for conservation.

The Yariguíes Mountains represent a previously unknown centre of avian endemism. In several high-elevation groups studied a three-way split of subspecifically or specifically distinct populations is revealed in the East Andes of Colombia: (i) main / southern East Andes; (ii) northern East Andes (Tamá); and (iii) Yariguíes. These centres are isolated by depressions within the East Andes and drier valleys. As a general rule, Yariguíes populations are darker than others, which may be linked to higher levels of precipitation.

Taxonomic limits were discussed in the context of the various descriptions of new bird taxa from Yariguíes. Thomas noted that several new 'subspecies' described from the region would be regarded as species using liberal concepts such as those employed by the BOU. However, sympatric species in relevant genera show greater inter-specific differences than Yariguíes taxa do from geographically proximate populations. As a result, subspecies treatment seems more appropriate.

Prior to the talk, Robert Giles was presented by Thomas Donegan and Robert Prŷs-Jones with the plate of Antioquia Brown-banded Antpitta *Grallaria milleri gilesi*. This new taxon from Colombia was described in the March 2009 issue of *Bull. Brit. Orn. Cl.* by Donegan, Prŷs-Jones and Paul Salaman. The epithet honours Robert Giles in recognition of his conservation work in Colombia.

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ANNUAL GENERAL MEETING

The Annual General Meeting of the British Ornithologists' Club was held in the Rector's Residence, 170 Queens Gate, Imperial College, London, SW7 on Wednesday 29 April 2009 at 6 pm with Cdr. M. B. Casement OBE, RN, in the Chair. Fifteen members were present (including eight from the committee and one ex-officio). Apologies were received from: D. R. Calder, S. P. Dudley G. M. Kirwan, Mrs M. N. Muller, C. W. R. Storey and P. J. Wilkinson.

1. Minutes of previous meeting. The Minutes of the 2008 AGM held on 29 April 2008, which had been published (*Bull. Brit. Orn. Cl.* 128: 73–75), were approved and signed by the Chairman.

2. Chairman's report. The Chairman delivered his review, which can be read at the start of the Trustees' Annual Report on pp. 66–67.

3. Trustees Annual Report. The Chairman advised the meeting that the Trustees' Annual Report and Annual Accounts were again combined in the handout available at the meeting, and confirmed that these would be published in the June issue of the Bulletin. The Hon. Secretary referred members to those sections of the report covering Management, Membership and Activities, and read these aloud. The Hon. Treasurer drew attention to the income and expenditure details (shown on pp. 71–72) of the accounts and summarised the balance sheet (shown on p. 71). He drew attention to the fall in value of investments in line with world financial markets, but was pleased to report an increase in income. The Chairman thanked the Hon. Treasurer for his support and seconded his proposal that the accounts be formally accepted; all those present agreed.

4. The Bulletin. In the absence of the *Hon. Editor*, the Chairman referred to his report published in the Trustees' Annual Report, which can be found on p. 69 of this issue.

5. Publications report. The Chairman of the BOU–BOC Joint Publications Committee referred to his report published in the Trustees' Annual Report, which can be found on p. 69 of this issue.

6. Election of Officers and Committee. The Chairman said that the election of Officers was as proposed in the agenda as published in *Bull. Brit. Orn. Cl.* 129: 1:

(i) Miss H. Baker be elected *Chairman* (*vice* Cdr. M. B. Casement, OBE, RN)
(ii) Dr. R. P. Prŷs-Jones be elected *Vice-Chairman* (*vice* Miss H. Baker)
(iii) Mr S. A. H. Statham be re-elected as *Hon. Secretary*
(iv) Mr D. J. Montier be re-elected as *Hon. Treasurer*
(v) Three appointments to committee to be made (*vice* Dr. R. P. Prŷs-Jones, Dr J. H. Cooper and Mr P. J. Wilkinson) from the following nominations: Mr S. M. S. Gregory, Mr K. Heron Jones and Mr C. W. R. Storey

No other changes to the committee are proposed, as all other members are eligible to serve at least one more year in office.

Ex-officio members (in continuation):
Revd. T. W. Gladwin (*Chairman Joint Publications Committee*)
Prof. R. A. Cheke (*Hon. Publications Officer*)
Mr S. P. Dudley (*Administration Manager*)
Mr G. M. Kirwan (*Hon. Editor*)

All changes were proposed by Dr C. F. Mann, seconded by Revd. T. W. Gladwin and unanimously agreed by those present.

7. Any Other Business. There was no other business and the meeting closed at 6.30 pm.

BRITISH ORNITHOLOGISTS' CLUB

Founded 5 October 1892
Registered Charity No. 279583

Chairman's review

This is my fourth and, in naval jargon, my 'haul-down' report, as your Chairman. My heartfelt thanks are due, once again, to the many key members of Committee who have given me loyal support throughout another exceptionally busy year. You will read a summary of their activities in the appropriate sections of the Trustees' Report, and most will present their reports in person. Chief amongst these must be David Montier (*Hon. Treasurer*) who has once again produced a masterfully clear set of accounts and successfully managed our resources, despite a severe decline in the value of the Herbert Stevens Fund investments in the current financially difficult year. My special thanks also go to Tony Statham (*Hon. Secretary*) for his patience and support, for the administration of our meetings and speakers for dinners, and his excellent handling of administrative arrangements with Imperial College. Having held this post myself (1996–2004), I know he has not found it easy living in my shadow. Unfortunately, Guy Kirwan (*Hon. Editor*) cannot be with us today, but I wish to record our thanks to him for continuing to produce a high-quality Bulletin despite very difficult conditions, often from the depths of South America. I can apologise, on his behalf, for errors in the production of a recent issue, but steps have been taken recently to strengthen the Bulletin Subcommittee (BSC) to provide the additional support he needs. I am grateful to Nigel Collar for his advice and support as Chairman of the BSC, and to Steven Gregory who has now agreed to take on this challenging task, in addition to completing his invaluable work with the scanning project for all Bulletin back-numbers.

I thank Steve Dudley, once again, for his advice and support for the administration of our membership and subscriptions, and handling of sales of publications. The steady and continuing small decline in membership remains a matter of concern, but is similar to other comparable societies. I thank Tom Gladwin for continuing to chair the BOC–BOU Joint Publications Committee (JPC) and Bob Cheke for his contribution as Commissioning Editor of the Checklist series; also David Fisher and Eng-Li Green who continue to modernise the BOC website. My thanks are due to each of them for their key roles in managing our affairs. Sadly, your Committee says goodbye to Jo Cooper and Peter Wilkinson on completion of their four-year terms of office.

Our thanks are due to Imperial College for their excellent administrative support and for continuing to allow us very favourable rates, and especially for permitting us the excellent facilities of the Rector's Residence, at no extra charge, when our normal room in the Sherfield Building has not been available because of redecoration. The Club's projector has been put to good use throughout the year, and we are grateful to Pat Sellar and Ron Kettle for their technical skills with the sound equipment.

Two major projects continued to feature prominently in your Committee's discussions. We have agreed to maintain our grant towards the completion of the international Taxonomic Reference project (REFTAX). We have also agreed to finance, for a trial period of two years, the continuation of the publication of *Systematic notes on Asian birds* (SNAB), as an item in the Occasional Publications series, under the management of the JPC. The first issue is due to be published later this year.

Three years ago, we set ourselves a vision for the future, and a special meeting was held at Tring, in February 2007, to review and reform the activities and publications to further the stated charitable aims of this Club in this age of rapidly changing technologies. I hope all will agree that considerable progress has been achieved, but the task is not yet complete, and two targets remain, namely to find successors for our two chief Officers—David Montier and Tony Statham. Both have served with commendable dedication and loyalty, and have indicated a desire to retire. I thank them both for their continuing loyalty and support.

And finally, my thanks go to Helen Baker who, as my Vice-Chairman, has quietly and conscientiously supported me throughout my term and, in handing over to her as my successor, I urge you all to give her your encouragement and support. I wish her every success.

Cdr. Michael Casement, OBE, RN
29 April 2009

TRUSTEES' ANNUAL REPORT FOR 2008

List of Trustees—Committee

Cdr. M. B. CASEMENT, OBE, RN *Chairman* (2005)
Miss H. BAKER *Vice-Chairman* (2005)
S. A. H. STATHAM *Hon. Secretary* (2004)
D. J. MONTIER *Hon. Treasurer* (1997)
Dr J. H. COOPER (2005)
D. J. FISHER (2007)
Dr R. P. PRŶS-JONES (2007)
M. J. WALTON (2008)
P. J. WILKINSON (2005)

Dr J. P. HUME also served as a Trustee for part of the year covered by this annual report and accounts

Correspondence and enquiries to the *Hon. Secretary*, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST

Hon. Editor G.M. Kirwan

Independent Examiners Porritt Rainey, 9 Pembroke Road, Sevenoaks, Kent TN13 1XR

Bankers Barclays Bank plc, Dale House, Wavertree Boulevard, Liverpool L7 9PQ

Trustees of the Herbert Stevens Trust Fund The following served as Trustees of the Fund during the year covered by this annual report and accounts: Mr N. J. Crocker, Mr P. J. Oliver, Mr R. C. Price and Mr S. J. R. Rumsey

Objects of the Charity

The promotion of scientific discussion between Members of the British Ornithologists' Union (BOU) and others interested in ornithology, and to facilitate the dissemination of scientific information concerned with ornithology, with a particular emphasis on avian systematics, taxonomy and distribution. These objects are pursued through the Club's publications, especially the Bulletin published four times a year, and a regular programme of meetings.

Constitution and Committee

The British Ornithologists' Club was founded in October 1892. It currently operates under Rules revised in 2000 and approved at a Special General Meeting on 31 October of that year. Members of the Committee, who are also the trustees of the Club, are listed above with the dates of their appointment.

The Committee is responsible for the general control and management of the Club and consists of four Officers, namely a Chairman and a Vice-Chairman, each elected for a term of four years, an Hon. Secretary and an Hon. Treasurer, each elected for a term of one year and five other members, each of whom shall be elected for a term of four years. Elections to the Committee from amongst the Club's membership are by a simple majority of those Members of the Club present and voting at an AGM or a Special General Meeting. A Member may be co-opted by the Committee to fill a temporary vacancy until the following AGM.

Management

The Committee met six times during the year. Mr S. A. H. Statham was re-elected as Hon. Secretary and Mr D. J. Montier was re-elected Hon. Treasurer at the AGM on 29 April. Mr M. J. Walton was elected in succession to Dr J. P. Hume; no other changes to the Committee were proposed or made, as all other members were eligible to serve at least one more year in office.

Under the terms of an agreement between the Club and the BOU entered into in 2004, certain administrative matters are undertaken on behalf of the Club by the BOU Administrative Office under the management of Mr S. P. Dudley, the BOU Senior Administrator. Under this arrangement, Mr Dudley continued his ex-officio roles as Membership Secretary and advisor on publication matters, including management of BOC publications (publishing, sales and warehousing), subscription management of BOC Institutional Subscribers to the Bulletin and other Bulletin-related matters.

Membership

As at 31 December 2008, there were 420 paid-up members (447 in 2007)—217 from the UK and 203 overseas (45 countries). Overseas members comprise Europe (87), North America (49), Australasia (24), Africa (19), Asia (15) and South America (9). The Club welcomed 12 new members, but mourned the death of two, G. A. Hall (1978) and T. R. Smeeton (2002). Six resignations were received, and 31 were removed under Rule 24.

Institutions

The Bulletin was distributed to 104 institutes during 2008 (107 in 2007), with 25 in the UK and 79 overseas (24 different countries). Of the latter, 37 were in North America, 28 in Europe (including Russia), seven in Australasia, four in Africa, two in Asia and one in South America.

BOC–BOU Joint Publications Committee

Revd. T. W. Gladwin remained Chairman of the Joint BOC–BOU Publications Committee and Prof. R. A. Cheke remained Hon. Publications Officer.

Herbert Stevens Trust Fund

There was a change of Trustee for the Herbert Stevens Trust Fund on 29 January 2008 when Mr S. J. R. Rumsey was appointed in place of Mr P. J. Oliver who had given notice of his wish to resign. The Committee wishes to record its thanks to Mr Oliver for his services as Trustee since his appointment in 1985 and is very grateful for his valuable contribution to the management of the fund over such a long period. The Committee also thanks the continuing Trustees, Mr N. J. Crocker and Mr R. C. Price, together with Mr Rumsey, for their time and expertise advising on the performance of the fund.

Meetings

The number of evening meetings held at Imperial College, London, was maintained at six in 2008, with a total of 174 attendees, representing a mean attendance of 29. The programme of speakers during the year covered a variety of topics. The opening meeting in January gave members the benefit of Dr Nigel Collar outlining his recent work on *Birds and people*. In March, Dr Lars Svensson provided a detailed taxonomic analysis of four species of warblers found in the Caucasus and our AGM in April once again featured a series of short talks from members. These included a summary of the activities of Kálmán Kittenberger, a collector of African birds, a discussion on White Wagtails *Motacilla a. alba* wintering in Britain, reports of trips to Mozambique and Antarctica, and a question of why 'experts' cannot agree on an international name for certain species and, in particular, confusion over the names of *Anthus* pipits. A special meeting was held on Saturday 21 June at the Natural History Museum, Tring, to mark two 150th anniversaries—*viz.* the reading of the first papers on natural selection by Alfred Russel Wallace and Charles Darwin at the Linnean Society and the founding of the BOU; Revd. Tom Gladwin marked the occasion with a talk on the former topic but acknowledged the special relationship between the Club and its 'parent', the BOU. The summer meeting in July complemented the anniversary theme with Dr Jo Cooper focusing on the life and works of Charles Darwin. In September, Dr Sam Turvey gave the Club a fascinating insight into the world of the Moa and Richard Price concluded the Club's programme with a well-illustrated talk on the birds of Morocco. Summaries of all these talks are to be found in the Club News section of the Bulletin. The Committee was pleased to advise members that the cost of Club dinners was being maintained at £22.50 per head.

The Bulletin

Vol. 128 comprised 288 pages and 43 papers of broad geographical scope, albeit with the Neotropics again particularly well represented. Taxonomy and nomenclature remain Bulletin mainstays, and three new subspecies were described, all from South America, one a new *Arremonops* (Emberizidae) sparrow and the other two both *Grallaricula* (Grallariidae) antpittas. Other highlights included papers reporting the rediscoveries of two long-lost birds, Beck's Petrel *Pseudobulweria becki* and White-tailed Tityra *Tityra leucura*. For papers published in 2008, the interval between receipt and publication was 2–16 months, with a mean of *c.*12 months. The Bulletin received a total of 34 new manuscripts in 2008. Of these, five were rejected and the rest have been accepted or are still being refereed for potential publication. Grateful thanks are due, as ever, to referees who have given freely of their time and expertise; members of the Standing Committee on Ornithological Nomenclature (SCON), especially Edward Dickinson and Richard Schodde; to Eng-Li Green, of Alcedo Publishing, for her constant dedication to Bulletin duties, including production of the index; and Latimer Trend (printers) for their efficiency. Tony Statham prepared the cover information and Club Announcements, whilst staff at The Natural History Museum, Tring, continue to offer much-needed assistance in all manner of small but useful ways.

BOC–BOU Joint Publications Committee

Members. Revd. T. W. Gladwin (*Chairman*), Prof. R. A. Cheke (*Commissioning* and *Checklist Series Editor*), S. P. Dudley (*Publications Manager*), Prof. C. M. Perrins, D. J. Montier, N. J. Redman, S. A. H. Statham and Dr J. H. Cooper. This joint committee (JPC), which is responsible for the BOU's and BOC's non-journal publications, met twice in 2008; much of its business being conducted by e-mail. The Chairman is alternately appointed by the BOC and the BOU. Nominated in 2007 by the BOU, Tom Gladwin continues to chair the committee until April 2009. Dr J. H. Cooper kindly accepted an invitation to be co-opted onto the committee.

Publications. For various good reasons all publications in hand experienced further delays. *The checklist of the birds of Borneo* was published at the year-end, and *The checklist of the birds of Barbados* is now expected to be published in early summer 2009. The committee was pleased to receive the main part of the manuscript of *The checklist of the birds of the British Isles* and, subject to contract, publication is planned for 2009. *The Asian bird records of Richard Meinertzhagen* by Pamela Rasmussen and Robert Prŷs-Jones, now expected in 2009, will form the next in the BOC's Occasional Publication Series. The manuscript for the sixth volume in the series of *Systematic notes on Asian birds*, being the first of two issues to be financed by the BOC, is also expected in 2009. The committee continues to seek to maintain contact with authors of other potential titles and evaluate new proposals.

Acknowledgements. The committee is grateful to all who have contributed to its work, especially to Bob Cheke and Steve Dudley for progressing and managing the titles in its charge, and Angela Langford for kindly attending and preparing the minutes of its meetings.

Financial review

A surplus of £5,949 on the ordinary activities of the Club for 2008 is almost exactly £2,000 higher than in 2007, with much of that improvement resulting from a reduction in expenditure. In total, the incoming resources showed little change, though there are variations under the individual headings. A drop of £900 in membership subscriptions was partly offset by the catch-up in the recovery of income tax on Gift Aid and deeds of covenant, but the downward trend is a worry. Interest rates remained fairly high for much of 2008 resulting in an increase of £800 in interest received on the Club's cash deposits, whilst distributions from the Herbert Stevens Trust Fund investments improved by over £900.

Expenditure for the year was down by approximately £1,300 compared with 2007. Bulletin costs totalled £12,566 and are expected to rise further in 2009, taking them above the level of the current subscription income. A small sum spent during the year on the Bulletin scanning project has been charged against the Clancey Fund, which is specifically for additional expenditure related to the Bulletin. Further expenditure was incurred on the joint checklist series with the BOU, covering both *The birds of Borneo*, published at the end of the year, and *The birds of Barbados*, due to appear in 2009.

The major impact on the Club's finances, however, came from the serious collapse in share prices as stock markets suffered from the banking crisis. The value of the Herbert Stevens Fund fell by £82,930 (30%) over the year, giving a market value at 31 December of £190,836 against £273,766 the year before. As a result, the Club's total funds at the end of 2008 stood at £364,059, a net decrease of just short of £77,000.

Investments

There were no changes in the composition of the Herbert Stevens Fund during the year and it remains invested in three charity unit trusts. As mentioned above, the income improved, despite the falling market values, but in the current economic climate, it is likely that distributions in 2009 will be lower as companies reduce their dividends. Interest rates have also fallen sharply over the last few months and that, too, is expected to have a marked impact on the amount earned on cash deposit accounts.

Reserves

Fortunately, the Club has a reasonable level of liquidity at present and it is intended that expenditure, particularly on *The birds of Barbados* and *The checklist of the birds of the British Isles*, will continue as planned. In addition to the £20,000 Unrestricted Designated Fund for future publications, the two restricted funds, the Clancey bequest and the Publications Fund totalled £66,605 at the year-end and are held as backing for new developments for the Bulletin or additions to other Club publications respectively.

Risks

The Committee has reviewed the major risks to which the Club is exposed, particularly with regard to managing the Club's cash resources during a period when interest rates and unit trust distributions are expected to be strained. Expenditure on the Bulletin is a major item and has a regular production schedule, but timing of other publications, particularly the joint Checklists, produced in conjunction with the BOU, are less predictable as they rely on dedicated work by authors working on an entirely voluntary basis and with other commitments of their own. The production timetable is regularly reviewed to ensure that sufficient resources are available when required. The Herbert Stevens Fund is managed by three Trustees, who report regularly to the Committee.

Trustees' Responsibilities

Under the Charities Act 1993, the Trustees are required to prepare a statement of accounts for each financial year that gives a true and fair view of the state of affairs of the charity at the end of the financial year and of the incoming resources and application of resources in the year. In preparing the statement the trustees are required to:

- Select suitable accounting policies and then apply them consistently;
- Make judgements and estimates that are reasonable and prudent;
- State whether applicable accounting standards and statements of recommended practice have been followed, subject to any material departures disclosed and explained in the statement of accounts;
- Prepare the financial accounts on the going concern basis unless it is inappropriate to presume that the charity will continue its operations.

The Trustees are responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the charity and to enable them to ensure that any statement of account prepared by them complies with the regulations under section 41(1) of the Charities Act 1993. They are also responsible for safeguarding the assets of the trust and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

Approved and signed on behalf of the Trustees
M. B. Casement
Cdr. M. B. Casement, OBE RN,
Chairman
Date: 29 April 2009

BRITISH ORNITHOLOGISTS' CLUB
Registered charity No. 279583
BALANCE SHEET—31 December 2008

	Notes	2008		2007	
		£	£	*£*	*£*
FIXED ASSETS					
Projection Equipment	2		-		-
INVESTMENTS					
At market value	3		239,836		*322,766*
CURRENT ASSETS					
Stock of publications		100		*100*	
Cash at bank and in hand		7,674		*4,688*	
Cash on deposit		126,568		*122,024*	
Prepayments		510		-	
Other debtors		1,084		*1,171*	
		135,936		*127,983*	
CURRENT LIABILITIES					
Subscriptions in advance		(3,764)		*(4,146)*	
Creditors falling due within one year		(7,949)		*(5,563)*	
			124,223		*118,274*
TOTAL ASSETS			364,059		*441,040*
FUNDS					
Unrestricted					
Designated	4		20,000		*20,000*
Other	5		277,454		*357,918*
			297,454		*377,918*
Restricted	6		66,605		*63,122*
			364,059		*441,040*

Approved and Signed on behalf of the Trustees
M. B. Casement
Cdr. M. B. Casement, OBE, RN,
Chairman
Date: 29 April 2009

STATEMENT OF FINANCIAL ACTIVITIES—31 December 2008

	2008			*2007*
	Unrestricted	**Restricted**	**Total**	*Total*
	£	£	£	*£*
INCOMING RESOURCES				
SUBSCRIPTIONS AND DONATIONS				
Members	8,408	-	8,408	*9,042*
Institutional subscribers	3,408	-	3,408	*3,676*
Donations	72	-	72	*383*
Income Tax recoverable under Gift Aid & Deeds of Covenant	651	85	736	*130*
	12,539	85	12,624	*13,231*
INVESTMENT INCOME				
Herbert Stevens Trust Fund	12,370	-	12,370	*11,405*
Interest received	6,202	3,745	9,947	*9,113*
	18,572	3,745	22,317	*20,518*

SALES OF PUBLICATIONS					
Bulletin		200	-	200	*495*
Other BOC publications		316	-	316	*484*
Joint BOU/BOC publications		1,544	-	1,544	*1,621*
		2,060	-	2,060	*2,600*
OTHER INCOMING RESOURCES					
MEETINGS		3,892	-	3,892	*3,958*
OTHER INCOME		269	-	269	*151*
TOTAL INCOMING RESOURCES		37,332	3,830	41,162	*40,458*
RESOURCES EXPENDED					
CHARITABLE EXPENDITURE					
BOC BULLETIN					
Production, printing and distribution		12,566	-	12,566	*11,884*
Bulletin scanning project		-	347	347	-
OTHER PUBLICATIONS					
Production costs		5,565	-	5,565	*2,046*
Publicity, postage and packing		499	-	499	*613*
GRANTS		325	-	325	*5,000*
MEETINGS					
Room and equipment hire, speakers' expenses, etc.		1,423	-	1,423	*1,337*
Restaurant		3,853	-	3,853	*3,934*
ADMINISTRATION	7	10,635	-	10,635	*11,713*
TOTAL EXPENDITURE		34,866	347	35,213	*36,527*
EXCESS OF INCOME OVER EXPENDITURE		2,466	3,483	5,949	*3,931*
(Decrease) / Increase in value of investments	5	(82,930)	-	(82,930)	*(14,283)*
		(80,464)	3,483	(76,981)	*(10,352)*
TOTAL FUNDS brought forward at 1 January 2008		377,918	63,122	441,040	*451,392*
TOTAL FUNDS at 31 December 2008		297,454	66,605	364,059	*441,040*

NOTES TO THE ACCOUNTS—31 December 2008

1. ACCOUNTING POLICIES

a) Basis of Accounts. The financial statements are prepared under the historical cost convention as modified by the inclusion of investments in the Herbert Stevens Trust Fund at market values. They are also prepared in accordance with the Financial Reporting Standards for Smaller Entities and follow the recommendations in Accounting and Reporting by Charities: Statement of Recommended Practice (revised 2005).

b) Investments and Cash Deposits. The Herbert Stevens Trust Fund is invested in quoted charity unit trusts and included as investments in the Balance Sheet at year-end market values. Income from this fund and from cash deposits shown in the Balance Sheet under Current Assets is included in Incoming Resources in the Statement of Financial Activities on a receipts basis. The Clancey bequest is held in a fixed-term deposit account which forms part of the total of investments in the Balance Sheet. Interest on this deposit account is brought into the Statement of Financial Activities on an accruals basis.

c) Subscriptions. Subscriptions for the current year and any arrears are included in Incoming Resources in the Statement of Financial Activities. Subscriptions received in advance are carried forward in the Balance Sheet as Current Liabilities.

d) Expenditure is accounted for on an accruals basis.

e) Depreciation. Depreciation of fixed assets is calculated to write off their value over their expected useful lives at an annual rate of 25% on cost.

f) Publications. The cost of publications is written off in the Statement of Financial Activities as incurred except for a nominal stock value of £100 carried in the Balance Sheet.

2. FIXED ASSETS

Projection Equipment		2008
		£
Cost at 1 January and 31 December 2008		648
Accumulated depreciation at 1 January 2008		648
Charge for the year		-
At 31 December 2008		648
Net Book Value:	At 31 December 2008	-
	At 31 December 2007	-

3. INVESTMENTS—at market value

	2008	*2007*
	£	*£*
UNRESTRICTED FUNDS		
Herbert Stevens Trust Fund	190,836	*273,766*
RESTRICTED FUNDS		
Clancey bequest	49,000	*49,000*
	239,836	*322,766*

All investments are held in the UK.

4. UNRESTRICTED DESIGNATED FUND
for future publications

	2008
	£
Balance at 1 January 2008	20,000
Designated during the year	-
Balance at 31 December 2008	20,000

5. OTHER UNRESTRICTED FUNDS

	GENERAL FUND	HERBERT STEVENS TRUST FUND	TOTAL
	£	£	£
Balances at 1 January 2008	84,152	273,766	357,918
Decrease in value of investments during year	-	(82,930)	(82,930)
Excess of income over expenditure	2,466		2,466
Balances at 31 December 2008	86,618	190,836	277,454

6. RESTRICTED FUNDS

	CLANCEY BEQUEST	PUBLICATIONS FUND	TOTAL
	£	£	£
Balances at 1 January 2008	58,353	4,769	63,122
Gift Aid recovered	85		85
Expenditure on Bulletin scanning project	(347)	-	(347)
Interest received	3,484	261	3,745
Balances at 31 December 2008	61,575	5,030	66,605

a. The Clancey bequest was donated by the late Dr P. A. Clancey with the request that it should be used to support and enhance the Club's Bulletin.

b. The Publications Fund is available to finance Club publications other than regular issues of the Bulletin.

7. ADMINISTRATION EXPENSES

	2008	*2007*
	£	*£*
Club's share of rental of storage unit	1,839	*2,311*
Audit and Independent Examination fees	600	*600*
Depreciation	-	*162*
BOU administration services	6,685	*6,367*
Other administration expenses	1,511	*2,273*
	10,635	*11,713*

8. REIMBURSEMENT OF EXPENSES

Trustees do not receive any remuneration and have not been reimbursed for any costs they may incur in attending regular Trustee meetings. They are reimbursed for any other expenses incurred on behalf of the Club. The total amount reimbursed during the year was £613 (*2007 £753*).

INDEPENDENT EXAMINER'S REPORT TO THE TRUSTEES OF THE BRITISH ORNITHOLOGISTS' CLUB

I report on the accounts of the Club for the year ended 31 December 2008, which are set out on pages 71 to 74.

Respective responsibilities of Trustees and Examiner

The charity's Trustees are responsible for the preparation of the accounts. The charity's Trustees consider that an audit is not required for this year (under section 43(2) of the Charities Act 1993 (the 1993 Act)) and that an independent examination is needed. It is my responsibility to:

- Examine the accounts (under section 43(3)(a) of the 1993 Act);
- To follow the procedures laid down in the General Directions given by the Charity Commissioners (under section 43(7)(b) of the 1993 Act); and
- To state whether particular matters have come to my attention.

Basis of Independent Examiner's report

My examination was carried out in accordance with the General Directions given by the Charity Commissioners. An examination includes a review of the accounting records kept by the charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts, and the seeking of explanations from you as Trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit and, consequently, I do not express an audit opinion on the view given by the accounts.

Independent Examiner's statement

In connection with my examination, no matter has come to my attention:

(1) which gives me reasonable cause to believe that, in any material respect, the requirements:
  - to keep accounting records in accordance with s41 of the 1993 Act; and
  - to prepare accounts which accord with the accounting records and to comply with the accounting requirements of the 1993 Act have not been met; or

(2) to which, in my opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

Alan Peal
Alan Peal ACA—Principal
Porritt Rainey
Chartered Accountants
29 April 2009

David Snow 1924–2009

There can be few who were not shocked and saddened to hear of the death of David Snow, on 4 February, and many BOC members were at his funeral, at Wingrave on 19 February. All who have had the good fortune to know him would endorse the words in *The Times* obituary of 28 February: 'David Snow was one of the most important ornithologists to emerge during the great development of the subject as a productive branch of biology after the Second World War. Throughout his remarkable career, he never lost his enduring love of birds, and always evinced the delight he took in observing them.'

With similar glowing tributes also published in the *Daily Telegraph* and *Guardian*, and others due in *Ibis* and *British Birds*, there is little more to be said about how he came to achieve such international academic distinction. But, luckily for all obituary writers, this is chronicled in his delightful autobiography *Birds in our life*, originally written as a record for his family and published privately last summer. The book was reviewed in *Bull. Brit. Orn. Cl.* 129: 3–4 by his close friend and colleague at Tring, Michael Walters. Together with Barbara, his wife, herself an equally distinguished field worker, David carried out meticulous research over four decades. Barbara sadly died when the book was in its final stages of preparation, and so it became a tribute to their partnership of nearly 50 years. If you have not already obtained a copy, I do commend all readers to do so, without delay; it is a real joy, and is available direct from the publishers, Sessions of York (www.sessionsofyork.co.uk).

Chief among David's achievements were his pioneering studies, jointly with Barbara, in Trinidad (1956–61), of two Neotropical bird families, cotingas (Cotingidae) and manakins (Pipridae). Another major contribution to ornithological science was his appointment in the Galápagos Islands (1961–62), where he established, and supervised the construction of, the Charles Darwin Research Station, becoming its first director.

Back in the UK, he became involved in setting up the Common Bird Census and other population studies with the British Trust for Ornithology (1964–68), thence to the British Museum (Natural History), in South Kensington. With Derek Goodwin, he supervised the transfer of the bird collection to its present home at Tring (1968–72). Further expeditions with Barbara followed: to Costa Rica (1974), Ecuador and Venezuela (1976), and Colombia (1978).

David's researches culminated in his monograph *The cotingas* (published in 1982). His contributions to our knowledge of this group were honoured by Rick Prum's (2001) naming the genus *Snowornis* for two species of Andean green pihas. David also described a new cotinga himself, from south-east Brazil in 1980, and the rare north-east Brazilian endemic Alagoas Antwren *Myrmotherula snowi* is also named for him.

In a small way, David's early years are the converse of my own; from early childhood we both had an enduring interest in birds. A scholar at Eton College, David won a further scholarship to Oxford, to read classics, and seemed groomed for an academic career. But when called up for war service, he escaped the threat of a back-seat job ashore, and joined the Royal Navy Volunteer Reserve (1943–46), where he saw many successful actions against U-boats in the Battle of the Atlantic. But throughout this time at sea, he never lost his abiding passion for the accurate recording and identification of birds. On demobilisation, in 1946, he changed from classics to read zoology at Oxford, which set him on course for a prodigious career in ornithology. In my own case, I was a science student at Winchester College, and was groomed by my biology tutor to head for King's College, Cambridge, to read medicine but, just before taking the entrance exams, I changed to follow my family tradition for a career in the Royal Navy. There I developed a life-long interest studying birds that landed aboard ships at sea.

And that is how I first came into contact with David, when his name came to my notice through his sightings of species recorded in the western Atlantic. We exchanged occasional correspondence, over several years, when I became Chairman of the Royal Naval Birdwatching Society (RNBWS), and editor of *Sea Swallow*, and I sought his advice about identifications of landbirds recorded on ships in the western Atlantic and the Caribbean. But it was not until 1991 that we first met, as fellow members of the BOC Committee. I was a humble 'paper shuffler' and Club servant, whilst he was editor of the *Bulletin* (1991–97), with an illustrious international career in ornithology, as a former President of the British Ornithologists' Union (1983–87), and editor of *Ibis* (1968–73). Thus it was that David, knowing of my naval past, invited me to review for RNBWS his autobiography, which I gladly did (*cf. Sea Swallow* 57: 75).

David's spell as editor of *Bull. Brit. Orn. Cl.* was marked by two special publications, both listed on the Club's publications web page: *Avian taxonomy from Linnaeus to DNA* (1977), edited jointly with Bob Cheke, and his edited *Birds, discovery and conservation, 100 years of the British Ornithologists' Club* (1992). He came regularly to BOC dinner meetings, usually with Barbara, until age made travel to London difficult.

As anyone who worked closely with David will confirm, he was essentially a very shy and modest man, with a huge intellect, a phenomenal memory, and a passion for meticulous accuracy in all that he wrote. He was old-fashioned in his methods, and communicated in hard copy, often in his own clearly legible but tiny handwriting; he was also an accomplished artist. He shunned the instant communication of e-mail, and so was spared the many frustrations of temperamental computers.

Retirement meant nothing to David, and he continued his studies of the ever-changing populations of Song Thrushes *Turdus philomelos* and other garden birds in his local village. And he remained a frequent visitor to Tring, where friends remember talking birds with him, within a few days of his death. He will be sadly missed, but his legacy of scholarly books and papers are his permanent memorial on both sides of the Atlantic, and on library bookshelves worldwide.

Michael Casement

CORRIGENDUM

The figure below was inadvertently subject to a last-minute error in the production process of *Bull. Brit. Orn. Cl.* 129(1). Members can download a correct PDF of the entire paper at the following URL: http://boc-online.org/bulletins/bulletin129-correction.htm. We apologise to the authors, Paul Salaman, Thomas Donegan and Robert Prŷs-Jones, for this unfortunate error.

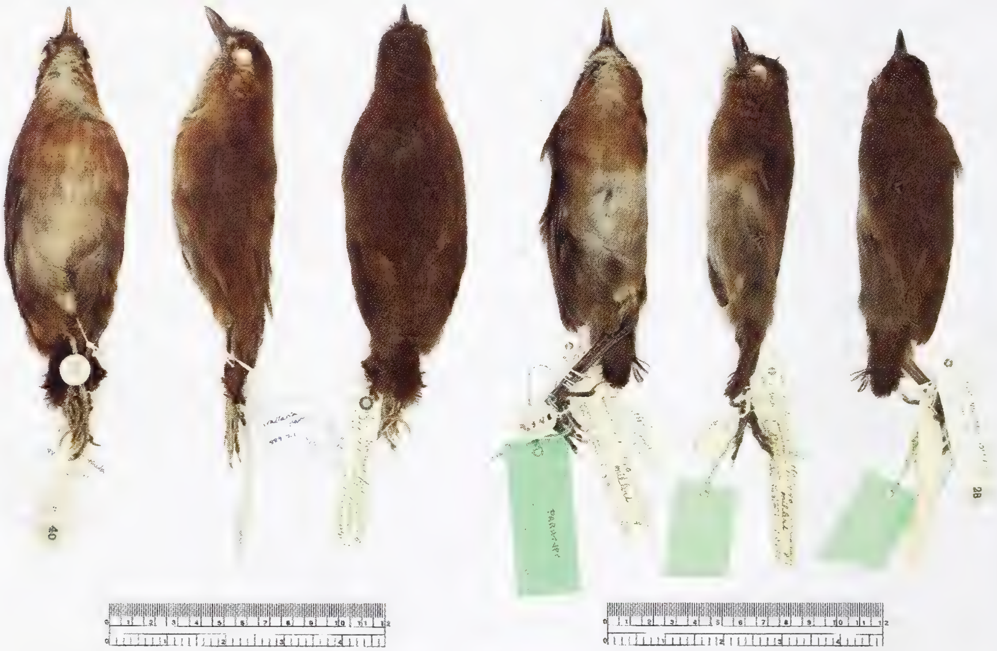

Figure 2. The *Grallaria m. gilesi* holotype (left three images) and *Grallaria m. milleri* paratype (right three images). © Natural History Museum, Tring.

Addendum to: Becking, J.-H. 2009. The Bartels and other egg collections from the island of Java, Indonesia, with corrections to earlier publications by A. Hoogerwerf. *Bull. Brit. Orn. Cl.* 129: 18–48.

Joost Brouwer has pointed out that the paper's Acknowledgements make no mention of the cooperation the author received from RMNH in Leiden, especially by Hein van Grouw. Dr Becking frequently remarked how grateful he was for Mr van Grouw's assistance.

Global warming and the breeding birds of the Arctic

by Bryan Sage

Received 3 April 2008

Summary.—The purpose of this paper is to outline some of the effects of global warming on Arctic habitats, to summarise some of the definitions of the Arctic that have been used in the past, to propose a tight definition of the area that would facilitate monitoring, and to provide a list of the breeding species of the area so defined. It is not intended to discuss the effects of global warming on individual species or populations, or to attempt to summarise the huge volume of ongoing research on climate change. It is recognised that any definition of the Arctic is open to criticism, but general agreement is a prerequisite for effective monitoring of the changes caused by global warming.

There are now very few scientists involved in climate change research who do not agree that marked global warming is occurring and is a serious issue, although opinions differ on the precise extent to which sea levels will rise and global temperatures increase. This is because different computer models give different results, and predictions are constantly changing as more data become available. The publication of ACIA (2004) presented the results of an assessment made by nearly 300 scientists, based not on worst-case scenarios but on observed changes by 2004, combined with projected temperature increases *below* the mid-range of those anticipated by increasingly accurate global climate models. These predictions have serious ecological implications. The Arctic is experiencing some of the most rapid and severe climate changes on the planet, and these are projected to increase substantially in the future. It is clear that many bird species currently breeding at northern latitudes will be affected by predicted changes, and it is essential that the situation be closely monitored. Publications that have been referred to include Zockler & Lysenko (2000), which was one of the first to closely examine the impact of climate change on Arctic breeding waterbirds, and ACIA (2004), which looks in detail at the impacts of global warming on the Arctic.

The effects of global warming

The ACIA report suggests that at least 50% of summer sea-ice in the Arctic will melt by 2099, along with a significant portion of the Greenland ice sheet, as the region is projected to warm by 4–7°C (other models predict 5–8°C) by the year 2100. Greenland could produce sufficient meltwater to eventually raise sea levels by *c.*7 m. Over the past 30 years the mean extent of sea-ice has decreased by *c.*8% and late summer ice coverage by 15–20%. In September 2002 the smallest extent of Arctic sea-ice cover on record was noted. More recently IPCC (2007) showed that in 2007 even less ice was recorded. This report states that satellite data since 1978 reveal that annual mean Arctic sea-ice extent has shrunk by 2.7% (2.1–3.3%) per decade, with larger decreases in summer of 7.4% (5.0–9.8%) per decade. In December 2006, the University Corporation for Atmospheric Research in the USA predicted that if greenhouse gases continue to build up in the atmosphere at the current rate, then by 2040 only a small amount of perennial sea-ice will remain along the north coasts of Greenland and Canada, and most of the Arctic basin will be ice-free in September. In 2008 the extent of the sea-ice was the lowest recorded since records began. Mean Arctic temperatures have increased at almost twice the global rate in the last 100 years. Should the Arctic Ocean become completely ice-free in summer, which some models predict, then the ecological consequences could be devastating. It was shown by ACIA (2004) that snow cover over Arctic land areas has declined by *c*.10% over the last 30 years or so, and it has been projected that it will decrease by an additional 10–20% by 2100. Recent decades have also seen widespread glacier melt, rising permafrost temperatures and increased coastal erosion. Reductions in sea-ice will drastically reduce the marine habitat for Polar Bears *Ursus maritimus*, ice-inhabiting seals and some seabirds.

In a region as large and diverse as the Arctic, the effects of global warming will not be uniform, because there are significant subregional variations in climate and recent warming has been more dramatic in some areas than in others. Generally, the treeline will move northwards and to higher elevations, with forest and shrubland replacing a significant proportion of the existing tundra habitats as the permafrost thaws, and tundra vegetation will shift north into polar desert habitat, which may be considerably reduced in extent or even eliminated. Existing forest-tundra habitats (in Canada and Russia) are likely to become more forested and thus less suitable for some species. These changes will result in northward shifts in the ranges of plant and animal species, and some might well become extinct. One region where biological diversity will be most at risk is Chukotka, northern Alaska and the western Canadian Arctic, which currently holds the largest number of threatened plant and animal species of any other arctic subregion, including >70% of rare Arctic plant species (ACIA 2004). As a result of these changes, Arctic biomes will be among the most severely affected by a warming climate, and will be among the first to show direct impacts. According to previous records in the Quaternary, large forest shifts of up to 2,000 km have been recorded. Deglaciation caused an average migration (even of long-lived trees) of 200–500 m/p.a. in response to rapid environmental changes, and such rates were sustained for several millennia (Huntley 1996).

It was suggested by Maddox (1996) that one region, extending from the north-east Canadian archipelago and west Greenland to Iceland, would experience lower temperatures at all seasons, a phenomenon caused by the strengthening of the Icelandic low to the south-east, resulting in increased north to north-westerly flow over this area. However, the IPCC (2007) report predicted a negative mass balance for the Greenland ice sheet, which is not consistent with a lower temperature. Should severe cooling occur it would adversely impact the breeding population of Greenland White-fronted Geese *Anser albifrons flavirostris*.

Species ranges are projected to shift north on both land and at sea, thereby bringing 'new' species into the Arctic whilst severely limiting the available suitable habitat to other species that are currently present. Some seabirds such as Ivory Gull *Pagophila eburnea* and Little Auk *Alle alle* are highly likely to be negatively affected by the decline in the extent of sea-ice and subsequent changes to the communities in which they live. *P. eburnea* is intimately associated with sea-ice during most of its life cycle. There is a complex interaction of factors that complicates predictions of the impacts of climate change on Arctic waterbirds. Species will not react statically to climate change and will certainly respond to changing habitats. Many will be able to extend their range with the northward shift of their preferred habitat. Clearly there are limits and in particular those species breeding on the edge of their range in high-Arctic habitats will encounter increasingly less suitable conditions as the climate warms. Most *Calidris* shorebirds will be unable to adapt to shrubby or tree-like habitats and cannot expand into other habitats, except perhaps for a few areas gained by retreating glaciers. Useful recent studies of the effects of climate change on Arctic birds include those by Boyd & Diamond (1994), Boyd & Madsen (1997) and Bauer *et al*. (2008).

The Intergovernmental Panel on Climate Change (IPPC 1998) predicted a major change in Arctic vegetation types, including a decrease of 40–57% of the area currently covered by tundra vegetation. Tundra is the most relevant biome for Arctic waterbirds, hence there are major implications for their populations. A possible scenario of changes to tundra habitat as predicted due to CO_2 doubling during the period 2070–99 indicates the possible extent of habitat loss for a range of species. The tundra-breeding Bean Geese *Anser fabalis rossicus / A. f. serrirostris* could lose 76% of their present tundra habitat. Comparable figures for other species include Red-breasted Goose *Branta ruficollis* 67%, Ross's Gull *Rhodostethia rosea* 54% and Red-necked Stint *Calidris ruficollis* 48%. Other tundra-nesting taxa will also be affected. However, there are extensive unvegetated areas in the Arctic at high elevations that may become suitable habitat for tundra-nesting species as the climate warms. Some tundra-nesting waders such as Great Knot *Calidris tenuirostris*, Baird's Sandpiper *C. bairdii* and Purple Sandpiper *C. maritima* are relatively scarce and nest at low densities. These may be able to withstand a substantial reduction in breeding habitat because that habitat is unsaturated at present.

Defining the Arctic

Global warming will bring changes to habitats and to bird populations currently breeding in the biome, and if these are to be accurately monitored then agreement regarding the boundary of the Arctic is essential. Whilst there has never been universal agreement on this point, the vast majority of ecologists and geographers have adopted the 10°C July isotherm as the southern boundary, as proposed by Koppen (1900), because this is closely correlated with the northern edge of the treeline (the northern limit of arborescent growth) or the northern limit of the boreal forest. However, the two lines do diverge, in places by up to *c.*160 km. Another important point relevant to this definition is that all of the areas included therein are underlain by continuous permafrost (see Fig. 5.2 *in* Sage 1986). Areas of continuous permafrost do, of course, occur south of the boundary proposed here.

The main disagreements revolve around whether or not Fennoscandia, Iceland, and sometimes the west coast of Alaska and the Aleutians should be included within the Arctic. Various authors have included all or some of these areas in their definition of the Arctic. For example, Stonehouse (1971) employed a wide definition that included most of Iceland, western Alaska south of Cape Prince of Wales, and various Bering Sea islands. A much tighter definition was adopted by Sage (1986) who excluded Iceland, Fennoscandia and, in Alaska, took the Continental Divide of the Brooks Range from Cape Lisburne east to the Canadian border as the southern limit. More recently Sale (2006), using a 'pragmatic approach', included Iceland but not Fennoscandia. In Canada he included the southern end of Hudson Bay, northern Quebec and Labrador. In Alaska he included the west coast (but little of the hinterland), the Pribilofs and Aleutians and, remarkably, Mount Denali (McKinley) National Park in the Alaska Range nearly 400 km south of the Arctic Circle. In Russia the Commander Islands, the Kamchatka Peninsula, and the north-east coast of the Sea of Okhotsk were all included.

The most extensive and confusing definition to be suggested to date is that of the CAFF (2001) report prepared for the Arctic Council. The CAFF boundary includes Iceland, much of mainland Scandinavia, and much of the hinterland of Russia, where it extends south of the July isotherm well into the boreal forest biome, but excludes Kamchatka and the Commander Islands. In Canada also it extends well below the July isotherm and into the boreal forest. In Alaska the boundary includes much of the south-west including the

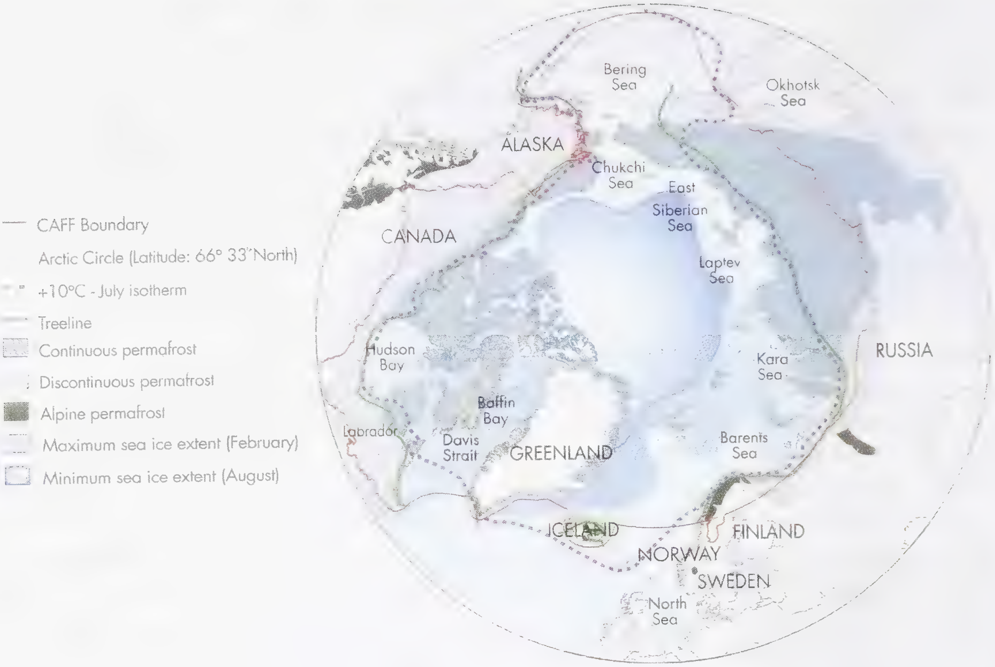
CAFF Boundary
Arctic Circle (Latitude: 66° 33′North)
+10°C - July isotherm
Treeline
Continuous permafrost
Discontinuous permafrost
Alpine permafrost
Maximum sea ice extent (February)
Minimum sea ice extent (August)
Bering Sea
Okhotsk Sea
ALASKA
Chukchi Sea
East Siberian Sea
CANADA
Laptev Sea
Hudson Bay
Kara Sea
RUSSIA
Baffin Bay
Labrador
Davis Strait
GREENLAND
Barents Sea
ICELAND
FINLAND
NORWAY
SWEDEN
North Sea

Figure 1. The limits of the Arctic according to various definitions (from CAFF 2001).

Aleutian chain. In ecological terms the CAFF boundary is completely illogical. The position of the CAFF boundary, the 10°C July isotherm, and the treeline are all shown in Fig. 1.

In defining the Arctic the July isotherm cannot be followed in its entirety because, in Alaska, it turns south to touch the Aleutians, goes on through the Bering Sea to pass across Kamchatka, and in Canada loops down to the southern end of Hudson Bay and proceeds east to include part of the forest-tundra habitat of Labrador. A modification of the 10°C July isotherm was suggested by Nordenskjold & Mecking (1928) to take account of the fact that the coldest point in the Northern Hemisphere lies in the Siberian boreal forest south of the isotherm. This modification has largely been ignored, except by Sale (2006).

There is strong rationale for not including certain areas within the true Arctic because most of them belong in the subarctic. In the case of Fennoscandia, because of the influence of the North Atlantic Drift, its climate, fauna and flora are all closer to those of the temperate zone, and what little permafrost is present is discontinuous. Iceland was excluded by Nordenskjold & Mecking (1928) on the basis of their research into its climate and flora. The Aleutians have no permafrost and are barely touched by the July isotherm. The Kamchatka Peninsula lies in the boreal forest zone and is underlain only by discontinuous permafrost. In a quite recent paper on floristic divisions in the Arctic, Yurtsev (1994) quite specifically excluded the Aleutians, Commanders and Pribilofs, Iceland and northernmost Scandinavia because of the boreal-oceanic aspect to their floras, which is expressed by a high proportion of boreal, particularly boreal-oceanic, species and other oceanic hypo-arctic and low-arctic taxa alien to circumpolar areas.

Finally, mention must be made of the forest-tundra habitat, which is quite extensive in Canada, but in Russia is restricted to a relatively narrow belt up to 300 km wide (see Figs. 1.2 and 1.4 *in* Sage 1986). This habitat basically represents a zone of intergradation between the boreal forest and true tundra, and was assigned to the subarctic by Love (1970).

However, it was suggested by Rosseau (1952) that the forest-tundra is not a transitional habitat, but comprises purely arctic patches imprisoned within a network of subarctic forest strips. Insofar as birds are concerned, assigning the forest-tundra zone to the subarctic makes very little difference as it only excludes basically forest species that penetrate the forest-tundra, but do not usually reach the true tundra.

The variety of definitions mentioned above, no two of which are identical, illustrate the difficulty of monitoring changes in breeding bird populations. What is required for this purpose is a tight definition of the true Arctic, as opposed to the subarctic. It is suggested that the most practical definition of the true Arctic could be a modification of that used by Sage (1986), where the southern boundary in Alaska ran westwards from the Canadian border along the Continental Divide of the Brooks Range to Cape Lisburne (see Fig. 1.3 *in* Sage 1986). It is proposed that this boundary be amended to include the coastal highlands of rolling topography and gentle slopes, tundras, and plains and lowlands south from Cape Lisburne as far as and including the Seward Peninsula. The taiga habitat extends on to the south-eastern quarter of the peninsula, but this is excluded. The whole of this additional area is underlain by continuous permafrost (see Fig. 5.2 *in* Sage 1986). The forest-tundra zone in Canada is regarded as subarctic, leaving the extreme north of the Ungava Peninsula in the true Arctic. All of Greenland, along with Svalbard, is included. In Russia, as in Canada, the forest-tundra belt is considered as subarctic, whilst the polar desert and tundra biomes comprise the true Arctic. Also included therein are the tundra areas of the Chukotka Peninsula.

Breeding species of the true Arctic

A few workers have produced lists of Arctic breeding birds, e.g., Salomonsen (1972) who listed 141 species as breeding regularly in the region. In Sage (1986) 183 species were recognised including several of marginal occurrence. The differing totals are mainly due to slightly varying views regarding boundaries, and the availability of new information. A much higher total of 280 species was given in CAFF (2001). However, nowhere in this publication is a full list given, the appendix listing only those mentioned in the text. Furthermore, Surfbird *Aphriza virgata* is shown as breeding entirely in the Arctic, yet its breeding range includes the Alaska Range and south to the Chugach Mountains, both outside even CAFF's wide definition of the Arctic. Earlier, Scott (1998) stated that of the 449 species of birds that breed or have bred (listed in Appendix 1) in the Arctic region, 279 breed in significant numbers within the Arctic, but nowhere is it explained what the difference is between 'the Arctic region' and 'the Arctic'. The list in Scott's Appendix 1 includes many species which have never previously been suggested as having any connection with the polar region, for example Eurasian Capercaillie *Tetrao urogallus*, Corncrake *Crex crex*, Black Woodpecker *Dryocopus martius* and Palm Warbler *Dendroica palmarum*. It also lists Water Rail *Rallus aquaticus* and Common Snipe *Gallinago gallinago* as having bred occasionally in Greenland. However, D. Boertmann (1994 and *in litt*. 2008) states that neither of these latter two species has ever bred there.

Within the true Arctic as defined above, 203 species are considered to have bred (Appendix 1). Order, taxonomy and names follow Gill & Wright (2006). In Collinson *et al.* (2008) American Herring Gull *Larus smithsonianus* is recognised as a species distinct from Herring Gull *L. argentatus*, but this split is not adopted here as it has not been accepted by the American Ornithologists' Union at the time of writing. Some species listed are of marginal occurrence in the Arctic or have very limited distributions, and these are identified in Appendix 1. Also shown are the number of breeding species in Alaska, Canada, Greenland, Svalbard and Russia. Eskimo Curlew *Numenius borealis*, which formerly bred in northern Canada, has been omitted as it is probably extinct. Also omitted are Common Sandpiper *Actitis hypoleucos* and Brambling *Fringilla montifringilla*, which bred on the Yamal Peninsula, Russia, in 1950 during a period of climatic amelioration, but have not done so since (P. Tomkovich *in litt.* 1985). Whooper Swan *Cygnus cygnus* formerly bred in Greenland but no longer does so (Boertmann 1994), and Barn Swallow *Hirundo rustica* has bred once (possibly twice) on the Arctic Slope of Alaska (Pitelka 1974). Finally, Baikal Teal *Anas formosa*, which formerly bred on the northern Russian tundra and, in the early 20th century, as far north as Bolshoy Lyakhovsky Island, in the New Siberian Archipelago, is now a rare species and few breeding records are available, so it is excluded from the list (P. Tomkovich *in litt.* 2008).

Acknowledgements

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Appendix. Breeding birds of the Arctic

	Alaska	Canada	Greenland	Svalbard	Russia
Willow Ptarmigan *Lagopus lagopus*	x	x			x
Rock Ptarmigan *Lagopus mutus*	x	x	x	x	x
Bean Goose *Anser fabalis*					x
Pink-footed Goose *Anser brachyrrhynchus*			x	x	
Greater White-fronted Goose *Anser albifrons*	x	x	x		x
Lesser White-fronted Goose *Anser erythropus*					x*(a)
Emperor Goose *Anser canagicus*	x				x*
Snow Goose *Chen caerulescens*	x	x	x		x
Ross's Goose *Chen rossii*		x			
Canada Goose *Branta canadensis*	x	x	x		
Cackling Goose *Branta hutchinsii*	x	x			
Brant Goose *Branta bernicla*	x	x	x	x	x
Barnacle Goose *Branta leucopsis*			x	x	x
Red-breasted Goose *Branta ruficollis*					x
Trumpeter Swan *Cygnus buccinator*	x	x			
Tundra Swan *Cygnus columbianus*	x	x	x		x
Whooper Swan *Cygnus cygnus*					x*
Eurasian Wigeon *Anas penelope*					x*(a)
American Wigeon *Anas americana*	x	?			
Mallard *Anas platyrhynchos*	x	x	x		
Northern Shoveler *Anas clypeata*	x	x			
Northern Pintail *Anas acuta*	x	x	x		x
Eurasian Teal *Anas crecca*	x	x	x		x
Redhead *Aythya americana*	x(d)				
Tufted Duck *Aythya fuligula*					x*©
Greater Scaup *Aythya marila*	x	x			x
Lesser Scaup *Aythya affinis*	x	x			
Steller's Eider *Polysticta stelleri*	x				x
Spectacled Eider *Somateria fischeri*	x				x
King Eider *Somateria spectabilis*	x	x	x	x	x
Common Eider *Somateria mollissima*	x	x	x	x	x
Harlequin Duck *Histrionicus histrionicus*	x	x	x		x
Surf Scoter *Melanitta perspicillata*	x	x			
Velvet Scoter *Melanitta fusca*					x
White-winged Scoter *Melanitta deglandi*	x	x			
Black Scoter *Melanitta nigra*					x
American Scoter *Melanitta americana*	x	x			
Long-tailed Duck *Clangula hyemalis*	x	x	x	x	x
Barrow's Goldeneye *Bucephala islandica*			x		

Red-breasted Merganser *Mergus serrator*	x	x	x		
Red-throated Loon *Gavia stellata*	x	x	x	x	x
Black-throated Loon *Gavia arctica*					x
Pacific Loon *Gavia pacifica*	x	x			x
Great Northern Loon *Gavia immer*	?	x	x		
Yellow-billed Loon *Gavia adamsii*	x	x			x
Northern Fulmar *Fulmarus glacialis*	x	x	x	x	x
Red-necked Grebe *Podiceps grisegena*	x	x	x		x
Horned Grebe *Podiceps auritus*		x			x
Great Cormorant *Phalacorax carbo*			x		
Pelagic Cormorant *Phalacrocorax pelagica*	x				x
Merlin *Falco columbarius*	x	x			x
Gyrfalcon *Falco rusticolus*	x	x	x		x
Peregrine Falcon *Falco peregrinus*	x	x	x		x
White-tailed Eagle *Haliaeetus albicilla*			x		x*(a)
Bald Eagle *Haliaeetus leucocephalus*		x			
Northern Harrier *Circus cyaneus*	x	x			x*(a)
Pallid Harrier *Circus macrourus*					x*(a)
Roughleg *Buteo lagopus*	x	x			x
Golden Eagle *Aquila chrysaetus*	x	x			x*(a)
Siberian Crane *Grus leucogeranus*					x
Sandhill Crane *Grus canadensis*	x	x			x
European Golden Plover *Pluvialis apricaria*			x		x
American Golden Plover *Pluvialis dominica*	x	x	x		
Pacific Golden Plover *Pluvialis fulva*	x	x			x
Grey Plover *Pluvialis squatarola*	x	x	x		x
Common Ringed Plover *Charadrius hiaticula*		x	x	x	x
Semipalmated Plover *Charadrius semipalmatus*	x	x			x
Lesser Sand Plover *Charadrius mongolus*					x*
Eurasian Dotterel *Charadrius morinellus*	x				x
Jack Snipe *Lymnocryptes minimus*					x
Pin-tailed Snipe *Gallinago stenura*					x
Great Snipe *Gallinago media*					x*
Common Snipe *Gallinago gallinago*					x
Wilson's Snipe *Gallinago delicata*	x	x			
Long-billed Dowitcher *Limnodromus scolopaceus*	x	x			x
Hudsonian Godwit *Limosa haemastica*		x			
Bar-tailed Godwit *Limosa lapponica*	x				x
Whimbrel *Numenius phaeopus*	x	x	x		x
Bristle-thighed Curlew *Numenius tahitiensis*	x(d)				
Spotted Redshank *Tringa erythropus*					x
Lesser Yellowlegs *Tringa flavipes*	x	x			
Solitary Sandpiper *Tringa solitaria*	x	?			
Wood Sandpiper *Tringa glareola*					x
Terek Sandpiper *Xenus cinerea*					x©
Spotted Sandpiper *Actitis macularius*	x	x			
Upland Sandpiper *Bartramia longicauda*	x				
Grey-tailed Tattler *Heteroscelus brevipes*					x*
Wandering Tattler *Heteroscelus incanus*	x	x			x*
Ruddy Turnstone *Arenaria interpres*	x	x	x	x	x
Black Turnstone *Arenaria melanocephala*	x				
Surfbird *Aphriza virgata*	x				
Great Knot *Calidris tenuirostris*					x
Red Knot *Calidris canutus*	x	x	x	x	x
Sanderling *Calidris alba*		x	x	x	x
Semipalmated Sandpiper *Calidris pusilla*	x	x			x
Western Sandpiper *Calidris mauri*	x	x			x
Red-necked Stint *Calidris ruficollis*	x				x
Little Stint *Calidris minuta*					x

Temminck's Stint *Calidris temminckii*					x
Least Sandpiper *Calidris minutilla*	x	x			
White-rumped Sandpiper *Calidris fuscicollis*	x	x			
Baird's Sandpiper *Calidris bairdii*	x	x	x		x
Pectoral Sandpiper *Calidris melanotos*	x	x	x		x
Sharp-tailed Sandpiper *Calidris acuminata*					x
Curlew Sandpiper *Calidris ferruginea*	x				x
Purple Sandpiper *Calidris maritima*		x	x	x	x
Rock Sandpiper *Calidris ptilocnemis*	x(d)				x
Dunlin *Calidris alpina*	x	x	x	x	x
Stilt Sandpiper *Calidris himantopus*	x	x			
Spoon-billed Sandpiper *Eurynorhynchus pygmeus*					x
Broad-billed Sandpiper *Limicola falcinellus*					x
Buff-breasted Sandpiper *Tryngites subruficollis*	x	x			x
Ruff *Philomachus pugnax*					x
Red-necked Phalarope *Phalaropus lobatus*	x	x			x
Red Phalarope *Phalaropus fulicarius*	x	x	x	x	x
Mew Gull *Larus canus*	x	x			x*
Great Black-backed Gull *Larus marinus*		x	x	x	x
Glaucous Gull *Larus hyperboreus*	x	x	x	x	x
Iceland Gull *Larus glaucoides*		x	x		x
Thayer's Gull *Larus thayeri*		x	x		
Herring Gull *Larus argentatus*		x	x		x
Lesser Black-backed Gull *Larus fuscus*			x		x
Common Black-headed Gull *Larus ridibundus*			x		
Ivory Gull *Pagophila eburnea*		x	x	x	x
Ross's Gull *Rhodostethia rosea*		x	x	x	x
Sabine's Gull *Xema sabini*	x	x	x	x	x
Black-legged Kittiwake *Rissa tridactyla*	x	x	x	x	x
Arctic Tern *Sterna paradisaea*	x	x	x	x	x
Aleutian Tern *Sterna aleutica*	x(d)				
Great Skua *Stercorarius skua*				x	
Pomarine Skua *Stercorarius pomarinus*	x	x			x
Parasitic Jaeger *Stercorarius parasiticus*	x	x	x	x	x
Long-tailed Jaeger *Stercorarius longicaudus*	x	x	x	x	x
Little Auk *Alle alle*		x	x	x	x
Thick-billed Murre *Uria lomvia*	x	x	x	x	x
Common Murre *Uria aalge*	x	x	x		x
Razorbill *Alca torda*		x	x	x	
Black Guillemot *Cepphus grylle*	x	x	x	x	x
Pigeon Guillemot *Cepphus columba*	x				
Kittlitz's Murrelet *Brachyramphus brevirostris*	x(d)				x(b)
Parakeet Auklet *Aethia psittacula*					x(b)
Least Auklet *Aethia pusilla*	x(d)				x(b)
Crested Auklet *Aethia cristatella*					x(b)
Atlantic Puffin *Fratercula arctica*			x	x	x
Horned Puffin *Fratercula corniculata*	x				x
Tufted Puffin *Fratercula cirrhata*	x				x
Snowy Owl *Nyctea scandiaca*	x	x	x	x	x
Short-eared Owl *Asio flammeus*	x	x			x
Northern Flicker *Colaptes aurata*	x				
Say's Phoebe *Sayornis saya*	x	x			
Alder Flycatcher *Empidonax alnorum*	x(d)				
Great Grey Shrike *Lanius excubitor*	x	x			x©
Eurasian Magpie *Pica pica*					x
Carrion Crow *Corvus corone*					x(b)
Northern Raven *Corvus corax*	x	x	x		x
Sand Martin *Riparia riparia*	x(d)				x
American Cliff Swallow *Petrochelidon pyrrhonota*	x				

Horned Lark *Eromophila alpestris*	x	x	x		x
Sedge Warbler *Acrocephalus schoenobaenus*					x*(a)
Arctic Warbler *Phylloscopus borealis*	x				x
Willow Warbler *Phylloscopus trochilus*					x
Common Chiffchaff *Phylloscopus collybita*					x*(a)
Grey-cheeked Thrush *Catharus minimus*	x	x			x
Naumann's Thrush *Turdus naumanni*					x
Fieldfare *Turdus pilaris*			x		x*(a)
Redwing *Turdus iliacus*			x		x(a)
American Robin *Turdus migratorius*	x	x			
Bluethroat *Luscinia svecica*	x				x
Eurasian Stone Chat *Saxicola torquatus*					x*(a)
Northern Wheatear *Oenanthe oenanthe*	x	x	x		x
American Dipper *Cinclus mexicanus*	x	x			
Eurasian Tree Sparrow *Passer montanus*					x*(e)
House Sparrow *Passer domesticus*					x(e)
Siberian Accentor *Prunella montanella*					x*(a)
Western Yellow Wagtail *Motacilla flava*	x	x			x
Citrine Wagtail *Motacilla citreola*					x
White Wagtail *Motacilla alba*	x(d)		x		x
Meadow Pipit *Anthus pratensis*			x		x
Pechora Pipit *Anthus gustavi*					x
Red-throated Pipit *Anthus cervinus*	x				x
Buff-bellied Pipit *Anthus rubescens*	x	x	x		x
Common Redpoll *Carduelis flammeus*	x	x	x		x
Arctic Redpoll *Carduelis hornemanni*	x	x	x		x
Asian Rosy Finch *Leucosticte arctoa*	x(d)				x
Grey-crowned Rosy Finch *Leucosticte tephrocotis*	x				
Orange-crowned Warbler *Vermivora celata*	x(d)				
Blackpoll Warbler *Dendroica striata*	x(d)				
Yellow Warbler *Dendroica petechia*	x	x			
Northern Waterthrush *Seiurus noveboracensis*	x(d)	x			
Wilson's Warbler *Wilsonia pusilla*	x	x			
Rusty Blackbird *Euphagus carolinus*	x(d)	x			
Little Bunting *Emberiza pusilla*					x
Pallas's Reed Bunting *Emberiza pallasi*					x
Common Reed Bunting *Emberiza schoeniculus*					x*
Lapland Longspur *Calcarius lapponicus*	x	x	x		x
Smith's Longspur *Calcarius pictus*	x	x			
Snow Bunting *Plectrophenax nivalis*	x	x	x	x	x
Fox Sparrow *Passerella iliaca*	x	x			
Lincoln's Sparrow *Melospiza lincolni*	x(d)				
Harris's Sparrow *Zonotrichia querula*		x(a)			
White-crowned Sparrow *Zonotrichia leucophrys*	x	x			
Savannah Sparrow *Passerculus sandwichensis*	x	x			?
American Tree Sparrow *Spizella arborea*	x	x			
203 species	129	112	72	33	147

*	Of marginal occurrence in the Arctic	(22 species)
(a)	Breeds in the extreme south of the tundra zone	(13 species
(b)	Breeds on the Chukotski Peninsula	(4 species)
(c)	Extends into the tundra zone only along wooded valleys, particularly river valleys	(3 species)
(d)	Breeds on the Seward Peninsula	(17 species)
(e)	Associated with human settlements	(2 secies)

An Abbott's Booby *Papasula abbotti* on Rota, Mariana Islands: first historical record for the Pacific Ocean

by H. Douglas Pratt, Michael L. P. Retter, Douglas Chapman, W. Michael Ord & Paul Pisano

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SUMMARY.—We describe the first documented record of Abbott's Booby *Papasula abbotti* in the North Pacific, a female observed and photographed at Rota, the southernmost island in the Commonwealth of the Northern Mariana Islands (USA), in northern Micronesia, on 17 April 2007. Furthermore, on the same island, we also observed and photographed a subadult Red-footed Booby *Sula sula* with a black-tipped pink bill very similar to that of Abbott's. The available evidence suggests that pink is a normal but poorly documented bill colour variation for some older immature Red-footed Boobies and not a diagnostic feature of Abbott's or an indication of hybridisation between the two species.

Abbott's Booby *Papasula abbotti* is a rare and endangered member of the Sulidae with a relict distribution (BirdLife International 2000, Commonwealth of Australia 2001). Originally placed in the genus *Sula*, it is quite distinct from the more typical boobies (Olson & Warheit 1988). The species is currently known to nest only on the Australian territory of Christmas Island in the Indian Ocean (Yorkston & Green 1997; Fig. 1a), and is observed

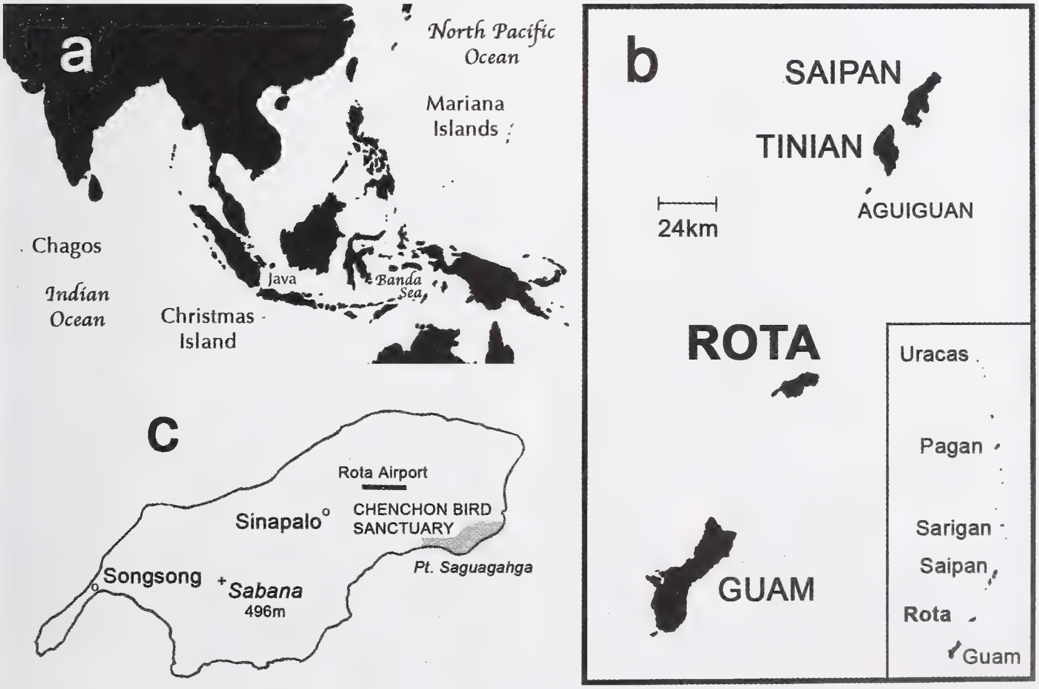

a
North Pacific Ocean
Mariana Islands
Chagos
Indian Ocean
Java
Banda Sea
Christmas Island
b
SAIPAN
TINIAN
AGUIGUAN
24km
ROTA
GUAM
Uracas
Pagan
Sarigan
Saipan
Rota
Guam
c
Rota Airport
Sinapalo
CHENCHON BIRD SANCTUARY
Pt. Saguagahga
Songsong
Sabana
496m

Figure 1. a) Map of the Indo-Pacific showing important localities mentioned in the text; b) The Mariana Islands, North Pacific Ocean; c) Island of Rota, showing sighting location of Abbott's Booby, geographic features mentioned in the text, main towns, and highest elevation.

infrequently at sea in the nearby ocean north to Java (Becking 1976, Dunlop *et al.* 2001). However, the type specimen was collected 6,300 km west of Christmas on Assumption Island, in the Aldabra Group north of Madagascar (Ridgway 1893, Skerrett *et al.* 2001), where the species is apparently extirpated (Nelson 1974, Prŷs-Jones *et al.* 1981). A few sightings from the Chagos Archipelago, between Assumption and Christmas islands (Bourne 1971, Hirons *et al.* 1976; Fig. 1a), including a 1996 observation of an immature visiting a large mixed-species seabird roost with Red-footed Boobies *Sula sula* (Symens 1999), suggest the possibility of a small remnant or incipient colony. Pre-cultural remains in the Mascarenes (Nelson 1974, Bourne 1976), as well as 6,000 km to the east on Tikopia (Steadman *et al.* 1990) and Efate (Steadman 2006) in eastern Melanesia, indicate that *P. abbotti* formerly had a much wider distribution, extending into the western South Pacific. A different subspecies (or species) *P. a. costelloi* is known from bones found in the Marquesas in eastern Polynesia (Steadman *et al.* 1988, Steadman 2006). Today, Abbott's Booby is almost never seen far from Christmas Island, although the 1990s Chagos sightings may have involved birds from there, and individuals disappear from the colony for long periods supposedly on distant foraging journeys (Commonwealth of Australia 2001). Balen (1996) summarised recent sightings in the Banda Sea in eastern Indonesia, and there are three recent 'continental' Australia records (Hassel & Boyle 1999, Palliser 2005, 2007). We report here the observation of a single female Abbott's Booby at Rota, the southernmost island in the Commonwealth of the Northern Mariana Islands (USA), in northern Micronesia (Fig. 1b). It is the first historical record from the Pacific, and the first ever for the North Pacific.

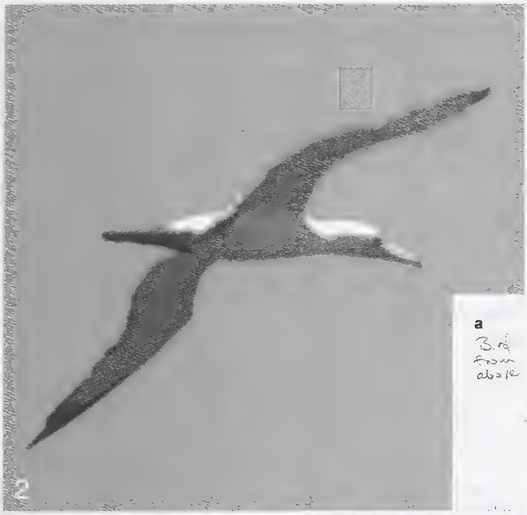
On 17 April 2007, as participants in a research expedition under the auspices of the North Carolina State Museum of Natural Sciences, we were observing birds from the clifftop platform above the seabird colony in Chenchon Bird Sanctuary on the south-east coast of Rota (Fig. 1c), encompassing Puntan Saguagahga (= Funiya Point). It is the only large seabird nesting colony in the main inhabited islands of the commonwealth, and the sanctuary provides both legal and physical (low-canopy trees between sheer cliffs and the sea) protection. Weather was characteristically hot with a clear blue sky as hundreds of Red-footed Boobies *S. sula* circled overhead or perched in their nest trees. Also present were lesser numbers of Brown Booby *S. leucogaster*, Brown Noddy *Anous stolidus*, White-tailed *Phaethon lepturus* and Red-tailed Tropicbirds *P. rubricauda*, Great Frigatebird *Fregata minor* and Common Fairy (White) Tern *Gygis alba*. At *c.*14.30 hrs, from the north-eastern visible terminus of the cliff, an unusual-looking booby flew toward us. It had a large head and narrow wings compared to the other boobies present, and was 'ungainly and prehistoric-looking' (MLPR field notes). It had a black tail and a black facial marking around the eye at the base of the upper mandible, which contrasted with the white head, neck and underparts. Based on the black tail and partial mask, some of us initially suspect-

Captions to figures on opposite page (a colour PDF can be downloaded at www.boc-online.org/bulletin-downloads.htm).

Figure 2 (top left). Abbott's Booby *Papasula abbotti*, Rota, Northern Mariana Islands, 17 April 2007 (M. L. P. Retter)

Figure 3 (top right). Field sketch by P. Pisano drawn shortly after sighting of Abbott's Booby *Papasula abbotti* on Rota, Northern Mariana Islands, 17 April 2007. Notes read as follows: A) bird from above; B) pinkish bill with black tip; C) mostly white body possibly with darker feathers interspersed; D) white head with thinner neck; E) solid, satin black upper surface of the wings—no white feathering and no clear difference between coverts and remiges; F) white rump? G) black tail.

Figure 4 (bottom). (a–c) Three views of probably the same subadult Red-footed Booby *Sula sula* showing black-tipped pink bill similar to that of Abbott's Booby *Papasula abbotti*, Rota, Northern Mariana Islands, 17 April 2007. (d) Subadult Red-footed Booby showing Abbott's-like black-tipped pink bill, Ulupau Head, Oahu, Hawaii, August 1974. (Photograph a by D. Gemmill, photographs b–d by H. D. Pratt.)



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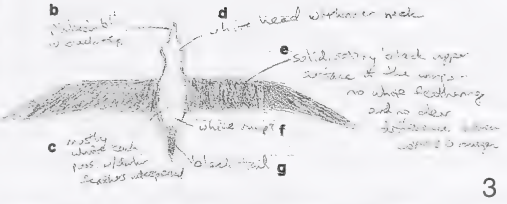
a
Bird from above
b
[illegible] bill
[illegible]
c
mostly white back poss. w/darker feathers interspersed
d
white head without neck
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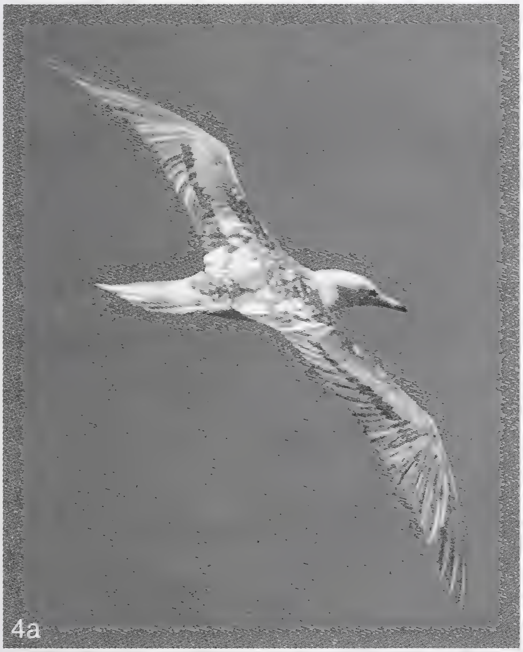
f
white rump?
g
black tail

3



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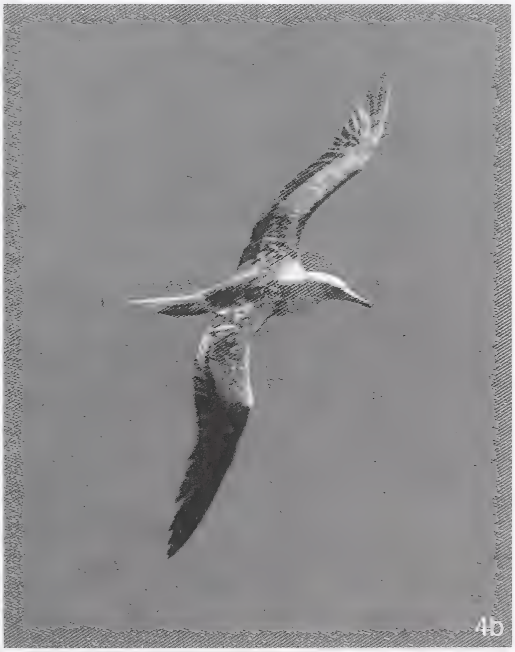

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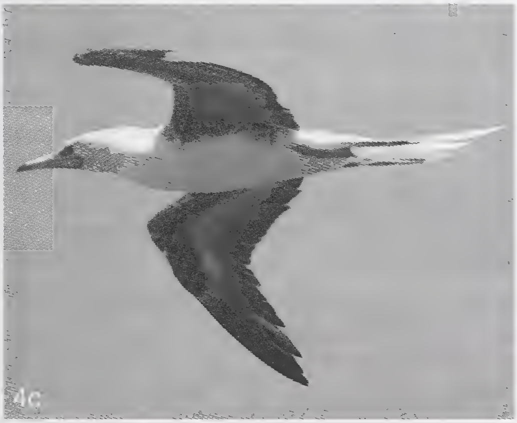

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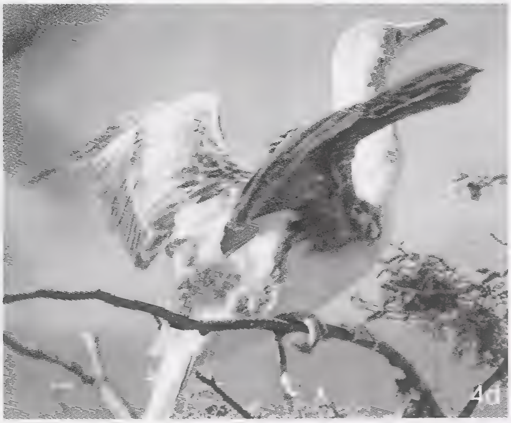

4d

ed the bird might be a juvenile Masked Booby *S. dactylatra*, a rare bird at this locality (Reichel 1991). As the bird circled and flew past us again, lower and *c*.60–100 m away, it afforded a good view of both wing surfaces. MLPR took a single photograph (Fig. 2) before the bird disappeared.

We identified it as an adult female Abbott's Booby based on the following: the bill was rose-pink with a dark tip (juveniles and adult males have a black-tipped grey bill; Pizzey & Knight 1997); the black marking on the face was confined to the lores at the base of the upper mandible and did not extend below the gape; the head, neck, nape and most of the underparts and underwings were white, the outermost primaries having black tips; the upperwings were black or very dark brown, with sharp, clean margins where they met the white central back; the rump was white with black mottling near the tail; and the posterior flanks just behind the wings exhibited an odd-shaped black patch, just visible in Fig. 2. We did not note feet and leg colours. PP made a field sketch with notes of the dorsal surface (Fig. 3). These include nearly all of the field marks given by Pizzey & Knight (1997).

We returned to the colony next day in the late afternoon, and PP spotted what he thought might be the same bird, circling at great distance with large numbers of Red-footed Boobies offshore, apparently preparing to return to the colony to roost. The bird never came sufficiently close for a positive identification. We subsequently learned that the colony extends quite far to the east, with only about one-third visible from the lookout. Perhaps the Abbott's Booby was roosting in the inaccessible portion. Abbott's is the only booby other than Red-footed (Schreiber *et al.* 1996) that nests and roosts in trees (Nelson & Powell 1986, Yorkston & Green 1997), which may explain why the bird was attracted to this site. Interestingly, another seabird endemic to Christmas Island, the golden subspecies of White-tailed Tropicbird *P.l. fulva*, is also a rare visitor to the Marianas, with records for Saipan (Pratt & Bruner 1981), Guam (Pratt *et al.* in prep.) and perhaps Rota (Pratt *et al.* 1987; based on hearsay, with source lost, HDP).

Another intriguing observation on the second day was of a subadult Red-footed Booby with a black-tipped pink bill very similar to that of Abbott's (Fig. 4a–c). We were unaware that some Red-footed can have this bill colour, and have found no description or illustration of it in any field guide. Schreiber *et al.* (1996) stated that the dark bill of the juvenile becomes pale grey with a black tip in immatures, before reaching the pink-based blue bill of adults. At no stage during such a transition would one expect the bill to be largely pink. We considered the possibility that the pink-billed bird might be a Red-footed × Abbott's hybrid, but later, among old photographs, found an example of a similar pink-billed bird from Hawaii (Fig. 4d), indicating that pink is a normal, albeit atypical and poorly documented, bill colour variation for some older immature Red-footed Boobies and not a diagnostic feature of Abbott's or an indication of hybridisation. Recently, observers at the Great Barrier Reef misidentified a pink-billed Red-footed as an Abbott's (D. J. James *in litt.* 2008). We offer our photographs to bolster the literature on maturational stages of Red-footed Booby and to help future observers avoid such errors.

We encourage future visitors to Rota to look for this Abbott's Booby to determine whether it was simply a long-distance vagrant or is a solitary resident. If the latter, the bird might indicate a (re)colonisation attempt or even a relict colony.

Acknowledgements

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Temporal segregation of breeding by storm petrels *Oceanodroma castro* (*sensu lato*) on St Helena, South Atlantic

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Summary.—The storm petrel *Oceanodroma castro* (*sensu lato*) complex shows considerable variation in the seasonal pattern of breeding throughout its extensive range in the Pacific and Atlantic Oceans. At several locations two seasonally separate, sympatric, populations exist, warranting recognition as separate species in at least one case. Here we report a hitherto unsuspected seasonal segregation of breeding among storm petrels on two small islets off St Helena in the South Atlantic. Egg laying occurs in two discrete periods, late March–early July ('cool season') and late September–late December ('hot season'). Most birds breed during the 'cool' season and their breeding success is substantially higher than that of those nesting in the 'hot' season. These results parallel the findings from similar studies of sympatric seasonal populations in both the Azores and Galápagos.

Sympatric breeding of temporally segregated populations of storm petrels of the *Oceanodroma castro* (*sensu lato*) complex has been well established at several locations for some years (e.g. Galápagos: Harris 1962; Azores: Monteiro & Furness 1998). Recent molecular, morphological and behavioural studies have greatly clarified taxonomic relationships amongst those populations in the Pacific and North Atlantic (Bolton 2007, Friesen *et al.* 2007, Smith *et al.* 2007), leading to the proposal to treat one such population specifically (Azores hot season: Bolton *et al.* 2008); further taxonomic revisions are anticipated. In contrast, populations in the South Atlantic have been less well studied (though see Allan 1962 for a detailed account from Ascension Island). Benson (1950) reported information obtained from local fisherman and a policeman during his visit to St Helena in January 1949, that egg laying occurred in October and November. Haydock (1954) found nests with eggs on George, Egg and Shore islands on 25 November 1952, and Stonehouse (1960) reported nests with fresh eggs on Egg Island on 14 November 1958. From a visit to Egg Island on 26 April 1959, Stonehouse (1960) reported just a single storm petrel without egg or chick, though with a freshly developed brood patch. More recent authors (e.g. Rowlands *et al.* 1998, Ashmole & Ashmole 2000, McCulloch 2004) all state that breeding occurs annually between October and December. Here we provide the first detailed information on breeding phenology of storm petrels nesting on two offshore islets of St Helena, South Atlantic, and examine breeding performance across six breeding cycles.

Methods

Study sites

St Helena (15°58′S, 05°43′W) lies 1,913 km from the west coast of Africa and *c.*800 km east of the mid-Atlantic ridge, having drifted some 150 km north-east from the hotspot on the African Plate where it was formed by volcanic activity about 14 MYA (Rowlands *et al.* 1998). The main island is surrounded by 24 satellite islets and stacks, most within 100 m of the coast and of very limited area, the largest being *c.*4 ha. Several species of predator (domestic cat *Felis cattus*, Black Rat *Rattus rattus*, Brown Rat *R. norvegicus* and Common Myna *Acridotheres tristis*) have been introduced to St Helena since the island's discovery in 1502. Seabirds vulnerable to predators are consequently restricted to these very small offshore islets and now occupy a very small proportion of their former potential range. The present study was undertaken on two neighbouring islets, Egg Island (*c*.4 ha) and Peaked Island (*c*.0.5 ha), which lie *c*.350 m apart and less than 100 m off the north-west coast. On these islets, storm petrels nest under lava screes and in the remains of walls associated with former fortifications. Nests are often very close to the surface, the incubating bird being clearly visible. The islets also support large numbers of breeding Brown *Anous stolidus* and Black Noddies *A. minutus*. Whilst no avian or mammalian predators are resident on these two islets, Common Mynas visit from the main island and have been observed taking or scavenging seabird eggs and chicks (EB pers. obs.). Although St Helena lies well north of the Tropic of Capricorn, the climate is subtropical, with temperatures ameliorated by the south-east trade winds. The warmest month, March, is at the end of the austral summer (mean air temperatures at Jamestown, on the coast, range from 24.5–29.2°C) and the coolest month is September (19.6–23.8°C). Sea surface temperatures similarly peak in March (24.5–25.0°C) and are coolest at the end of the austral winter in September–October (19.5–21.5°C: Rowlands *et al*. 1998).

Monitoring protocols

Egg Island and Peaked Island were visited approximately monthly from November 2004 to June 2007. Nests of storm petrels were located by visual searches of suitable habitat over all parts of each islet that are safely accessible. Nests were marked with uniquely numbered tags to enable the breeding history at individual nests to be followed over the course of the three-year study period. The contents of each nest were recorded on each visit according to the following categories: adult incubating (egg present), downy chick (0–28 days), downy/feathered chick (29–49 days), nearly fledged chick (50–70 days). The approximate ages of each growth stage were assumed following Allan (1962). The approximate timing of laying, hatching and fledging was determined from the presence of incubating adults and back-calculation of laying dates from the ages of chicks assuming a 42-day incubation period from laying to hatching and a 70-day chick development period (Allan 1962, Harris 1969).

Data analysis

Daily egg and chick survival rates were calculated following Mayfield (1975) and their standard errors following Johnson (1979). The timing of egg and chick outcomes (i.e. hatch/fledge/fail) was assumed to have occurred halfway between visits (Mayfield 1975), unless the stage of development of the chick indicated otherwise. Hatching success (the percentage of eggs hatching) was calculated assuming a 42-day incubation period from laying to hatching and fledging success (the percentage of hatched chicks surviving to fledging) was calculated assuming a 70-day chick development period (Allan 1962, Harris 1969). Breeding success (the percentage of eggs laid that result in a fledged chick) was calculated as the product of hatching success and fledging success. Egg and chick survival rates were examined in relation to breeding season using a General Linear Model implemented in SAS v 9.1. Daily survival rates of eggs and chicks were modelled as a binomial response variable with the number of days exposure as a binomial denominator (see Aebischer 1999).

Results

Timing of breeding

The occurrence of incubating storm petrels on each islet showed two distinct seasonal peaks, with an absence of incubation at other times of year (Fig. 1). The estimated egg-laying periods, from timing of incubation and back-calculation for nests containing chicks, are from late March to early July ('cool' season) and late September to late December ('hot' season). The chick-rearing periods lasted from mid May to late October in the 'cool' season and from early November to late April in the 'hot' season. There was a single instance of a downy chick present in a newly discovered nest on 28 March 2006, which probably related to a late 'hot'-season breeding attempt (egg laid in January). The same nest was occupied by an incubating 'cool'-season adult when it was next checked on 25 April.

The number of nests monitored from the egg stage during each season ('hot' and 'cool') is given in Table 1. Whilst these data do not represent a systematic assessment of absolute population size, they do strongly suggest that larger numbers of birds breed during the 'cool' season (late March–late October), given the similar level of search effort in each season.

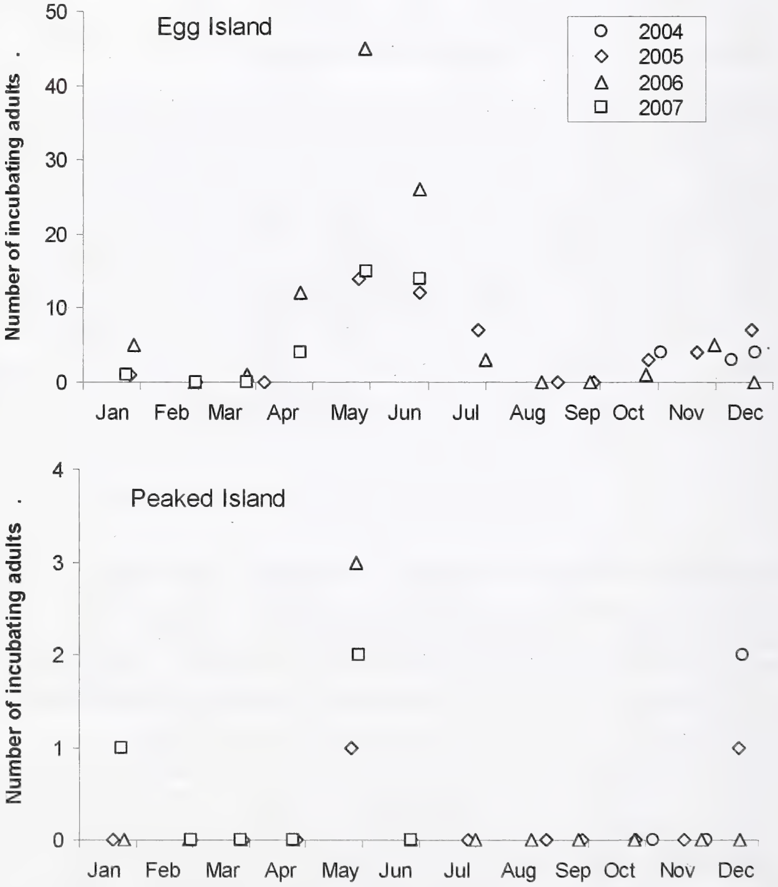

Figure 1. Number of incubating storm petrels *Oceanodroma castro* by date at Egg Island and Peaked Island, St Helena, South Atlantic, November 2004 to June 2007. Laying occurs in two distinct periods, late March–early July ('cool season') and late September–late December ('hot season'). The total number of incubated nests present at each visit is shown, so some nests were recorded on more than one visit.

TABLE 1

Number of nests monitored from the egg stage on Egg Island and Peaked Island each season.

	'Cool' season (laying March–July)			'Hot' season (laying September–December)		
	2005	**2006**	**2007**	**2004***	**2005**	**2006**
Egg Island	42	87	34	13	24	12
Peaked Island	3	4	3	2	0	2

* Refers to calendar year in which eggs were laid. Note that chicks hatching from eggs laid during the 'hot' season will not fledge until the following calendar year.

TABLE 2

Daily survival rates of eggs and chicks of storm petrels *Oceanodroma castro* nesting on Egg Island and Peaked Island, St Helena, South Atlantic (± 1SE). Note monitoring ceased before the main chick-rearing period in the cool season in 2007 precluding assessment of chick survival rates.

	'Cool' season (laying March–July)			'Hot' season (laying September–December)		
	2005	**2006**	**2007**	**2004**	**2005**	**2006**
Daily nest survival	0.980 ± 0.005	0.979 ± 0.003	0.971 ± 0.008	0.971 ± 0.011	0.960 ± 0.010	0.966 ± 0.012
Hatching success	0.427	0.412	0.291	0.286	0.182	0.233
Daily chick survival	0.992 ± 0.003	0.994 ± 0.002		0.992 ± 0.008	0.938 ± 0.061	0.963 ± 0.036
Fledging success	0.555	0.671		0.566	0.011	0.071
Breeding success	0.237	0.277		0.162	0.002	0.017

Breeding success of seasonal populations

Insufficient nests were available for study on Peaked Island to permit an assessment of breeding success for the two islets separately, so data were pooled. Storm petrels breeding during the 'cool' season achieved higher levels of productivity than those nesting during the 'hot' season due to higher daily survival of eggs (Table 2, differences between season, all years pooled: $X^2_1 = 5.35$ $P=0.02$). Although there was a slight tendency for chick survival rates also to be higher during the 'cool' season compared to the 'hot' season, the difference was not significant (data for all years pooled $X^2_1 = 2.45$ $P=0.12$).

Discussion

The *Oceanodroma castro* (*sensu lato*) complex shows a diverse range of seasonal breeding patterns throughout its range in both the Pacific and North Atlantic. At some breeding locations laying occurs in a single, short season: for example on Vila Islet, Santa Maria, Azores (Monteiro *et al*. 1996a,b, Monteiro & Furness 1998). Elsewhere the laying season is more protracted, with seasonal peaks (e.g. Selvagem Grande: Mougin *et al*. 1990). At the far extreme, laying occurs in two separate seasons, with intervening periods where no laying occurs and with no interchange of individuals across seasons (e.g. Plaza Norte, Galápagos: Harris 1969; Praia and Baixo islets, Graciosa, Azores: Monteiro *et al*. 1996a,b, Monteiro & Furness 1998). In situations where seasonal segregation of populations is sufficiently ancient, genetic, morphological and behavioural differences are sufficient to warrant specific recognition of sympatric seasonal populations (e.g. the 'hot season' Monteiro's Storm Petrel *Oceanodroma monteiroi* of the Azores: Friesen *et al*. 2007, Bolton *et al*. 2008). Despite these recent advances in understanding of the seasonal nesting patterns of *O. castro* (*sensu lato*) elsewhere in its breeding range, the discovery of sympatric seasonally segregated breeding among storm petrels on St Helena was somewhat unanticipated as published data indicated that nesting occurred solely in October–December (Rowlands *et al*. 1998, Ashmole & Ashmole 2000, McCulloch 2004).

Here we have shown that in 2004–07 egg laying by storm petrels occurred in two distinct periods, late March–early July ('cool season') and late September–late December ('hot season'). These seasons correspond closely to those found on the Azores (Monteiro & Furness 1998, Bolton *et al.* 2008), but note that the application of terms 'hot' and 'cool' refer to the opposite periods since the Azores lie north of the equator.

Preliminary data suggest that, currently, substantially larger numbers of storm petrels nest on St Helena during the cool season (March–July) although historical records indicate the main egg-laying season was October–November (Rowlands *et al.* 1998), which accords with the main season for most other seabirds on St Helena (Brown Noddy, Black Noddy, Sooty Tern *Sterna fuscata* and White Tern *Gygis alba*), although Red-billed Tropicbirds *Phaethon aethereus* are reported to lay in all months (Rowlands *et al.* 1998). The waters immediately surrounding St Helena are generally characterised by low primary productivity, lacking the pronounced seasonal variation found at temperate latitudes, although more productive areas lie to the north and east, associated with the Benguela Current. It is notable that the low breeding success of both 'cool'- and 'hot'-season populations reported here is very similar to that measured in both the Galápagos (Harris 1969) and Azores (Bolton *et al.* 2004) breeding colonies. It implies early recruitment and high adult survival rates for population stability, or that these studies were carried out in years of abnormally and unsustainably low productivity.

The lack of historical records of 'cool-season' breeding by storm petrels on St Helena is curious, especially given the importance of fresh seabird eggs in the diet of the local inhabitants (hence the name 'Egg Island'). It is possible that the small eggs of storm petrels were not considered worth the effort of harvesting and so a 'cool-season' breeding population was ignored. An alternative explanation, suggested by the apparent absence of breeding storm petrels on the visit to Egg Island on 26 April 1959, is that 'cool-season' breeding has arisen extremely recently there.

Potential taxonomic implications

It is notable that all other sympatric population pairs of the *O. castro* complex show negligible levels of contemporary gene flow (Azores, Galápagos, Desertas, Selvagens, Cape Verde: Friesen *et al.* 2007), but vary considerably in divergence time (from *c.*200,000 ybp to a few tens of thousands of years). The absence of exchange of individuals between breeding seasons seems probable, as suggested by Harris (1969) for birds nesting on Plaza Norte, due to the need to schedule both breeding and feather moult into the annual cycle. Since feather moult typically takes 5–7 months to complete (Allan 1962, Bolton *et al.* 2008), even birds that fail early in the nesting season would probably be unable to complete feather moult before the onset of the next available breeding season. Clearly, more work is needed to establish rates of gene flow between the seasonal populations nesting on St Helena and to elucidate the taxonomic relationships with other populations in both the Atlantic and Pacific Oceans. The available evidence suggests that storm petrels nesting on Boatswainbird Island, Ascension, 1,296 km north-west of St Helena, breed only during the 'hot' season (laying October–December: Allan 1962). Although R. Allan arrived on Ascension in early July 1958, he did not undertake intensive field work on storm petrels until September, since it was believed very few storm petrels were breeding earlier in the year (Stonehouse 1960: 159, Allan 1962). Even so, back-calculation of laying dates of chicks found during the course of his study revealed laying occurred at six nests (of 115 studied) in May–September. In the light of the discovery of a hitherto unsuspected 'cool-season' population on St Helena, the extent of 'cool-season' breeding on Boatswainbird Island should be re-examined. Research should now focus on the possible mechanisms relating seasonal variation in food supply, nest site availability and the evolution of allochrony.

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Paedomorphosis in *Sporophila* seedeaters

by Juan Ignacio Areta

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SUMMARY.—Paedomorphosis can be defined as the 'retention of ancestral juvenile characters by later ontogenetic stages of descendants'. Female and immature *Sporophila* resemble each other, and are similar among several species. Here I present some cases of presumably sexually mature *Sporophila* males with immature-like plumage, and discuss the possible role of paedomorphosis in Dark-throated Seedeater *S. ruficollis*, Marsh Seedeater *S. palustris*, Capped Seedeater *S. bouvreuil*, Drab Seedeater *S. simplex* and Temminck's Seedeater *S. falcirostris*. Paedomorphosis in *Sporophila* might be the outcome of protracted plumage maturation. Additionally, the unrelated but also seed-eating Dull-coloured Grassquit *Tiaris obscurus* apparently originated through paedomorphosis. Although paedomorphosis seems a most likely explanation for the observed patterns, alternative explanations, like feminisation and retention of winter plumages ('eclipse'), should be further tested with the aid of detailed phylogenies and a thorough knowledge of moults and plumage features.

The remarkable similarity between the drab females and immatures in most *Sporophila* seedeaters make them among the most difficult birds in the Neotropics to identify both in the field and in the hand. Unidentified specimens held in several museums testify to this difficulty. In nature, females and immatures of the *c*.30 species of the genus can be generally separated with confidence only if accompanied by the usually diagnostically patterned males (Sabel 1990, Ouellet 1992, Remsen *et al*. 2007). The remarkable plumage variation in the genus *Sporophila* has been attributed to many different causes, among them: pigment abnormalities (Olson 1966), gynandromorphosis (Sick 1967), winter plumages (Sick 1967, 1997), hybridisation (Sick 1968, Narosky 1977, Olson 1981a, Stiles 1996), geographic variation (Olson 1981b, Stiles 1996), clinal / geographic variation (Kirwan 2007), ageing (Stiles 2004, Restall 2006) and the existence of plumage morphs (Stiles 2004, Restall 2006, Areta 2008). Another ubiquitous cause of variation is that of mature males with non-definitive or fundamentally immature-like plumage (Skutch 1954, Olson 1968, 1981a). Olson (1968) reported finding an immature-plumaged Ruddy-breasted Seedeater *S. minuta* with enlarged testes, as well as immature male Thick-billed Seed Finches *S. funerea* (=*Oryzoborus funereus*) with enlarged testes, and a transitional-plumaged Variable Seedeater *S. aurita* (*sensu* Olson 1968) also suspected to be breeding based on its swollen gonads. Skutch (1954) found White-collared Seedeaters *S. torqueola* breeding in transitional plumage. Amongst the 'capuchino' seedeaters of the *S. ruficollis* group (*cf*. Lijtmaer *et al*. 2004 and Areta 2008 for clade delimitation), full singing and territorial (potentially breeding) males of all species exhibit a plethora of different, partially mature, plumages (pers. obs.). At least some adult Marsh Seedeaters *S. palustris* occasionally moult into a, dull immature-like, non-breeding winter plumage ('eclipse') after the nesting season. This appears to be the rule in Dark-throated Seedeater *S. ruficollis*, Capped Seedeater *S. bouvreuil pileata* and Black-bellied Seedeater *S. melanogaster*, which then regain their adult or near-adult plumage prior to the next breeding period (Sick 1967, 1997; pers. obs.).

Changes in timing of development can play a pervasive role in the evolution of several vertebrate groups (Gould 1977, McNamara 1995, Carroll 1998). Delayed plumage maturation is a relatively widespread phenomenon in males, in which sexually mature individuals retain an essentially immature-like plumage for a period prior to attaining adult male plumage (Rohwer *et al*. 1980, 1986, Thompson 1995). Paedomorphosis is one possible outcome of changes in developmental timing and refers to the 'retention of ancestral juvenile characters by later ontogenetic stages of descendants' (Gould 1977: 484). In this context, the difference between delayed plumage maturation and strict paedomorphosis is that, in the latter, the birds would never acquire typical adult plumage.

My aims here are, firstly, to expose a series of previously unreported observations of anomalous wild and captive birds that can be properly understood as cases of paedomorphosis and delayed plumage maturation in the capuchinos, and, secondly, to explore the presence of paedomorphosis in the genera *Sporophila* and *Tiaris*.

The basic lack of knowledge about plumage sequences in the capuchinos greatly impedes the use of appropriate detailed terminology to describe them. Although the Humphrey-Parkes system (Humphrey & Parkes 1959, 1963) is extremely usefully employed in studying plumage evolution, here I will use the more general traditional 'Dwightian' terms (see Humphrey & Parkes 1959, 1963, and Howell *et al*. 2003, 2004). Future workers should bear in mind the limited usefulness of these terms to study evolutionary questions, and they are used here solely because of their ability to describe plumages in general terms when detailed sequences are unknown (Thompson & Leu 1994).

Several observations suggest the existence of arrested plumage development in members of the capuchinos clade.

Dark-throated Seedeater *Sporophila ruficollis*.—Two individuals from the same nest were trapped post-fledging in Saladillo, Buenos Aires province, Argentina (35°39′S, 59°57′W), in 1990. Over the next five years both individuals vocalised typical of *S. ruficollis* and went through several moult cycles. One acquired the species' normal adult male plumage, whilst the other repeatedly moulted into a female / immature-like plumage until its death five years later. Its identity was confirmed, through dissection, as male (M. Roda & P. Ferro pers. comm.). Another singing male in female / immature plumage was found at the same locality, feeding nestlings together with a female (M. Roda pers. comm.). A full singing but immature-looking bird was trapped at Gualeguaychú, Entre Ríos province (33°00′S, 58°30′W). After four years, the bird continued to sing its *S. ruficollis* song and moult each year into female / immature-like plumage (P. Tato pers. comm.). A third anomalous bird was trapped at Gualeguaychú and is held at the CICyTTP-CONICET for ongoing studies. When this female-like male was placed close to a captive adult male of a yet undescribed dark-collared seedeater, the adult male tried to copulate with it for several consecutive days. This observation provides preliminary and tentative evidence that male seedeaters are unable to discriminate between this male plumage and female plumages using solely visual cues. The bird is now at least three years old, sings like *S. ruficollis* and after several moults still had the appearance of a female / immature. During the spring / summer of its presumed fourth year of life it started acquiring male plumage following the standard sequence of plumage acquisition in the capuchinos (pers. obs.).

Marsh Seedeater *Sporophila palustris*.—A territorial bird singing like *S. palustris* was observed in a marsh at Estancia La Marita, Entre Ríos province, Argentina (33°20′S, 58°35′W) , on 12 December 2003. In plumage, it was indistinguishable in the field from the putative female accompanying it. However, each bird showed typical sex-based behaviour: the singing male was territorial and the female kept low in the vegetation, endeavouring to remain hidden, as they usually do when nesting. A second apparent male was tape-recorded giving the typical species-specific adult song at Colonia Carlos Pellegrini, Corrientes province, Argentina (28°35′S, 57°10′W), on 7 January 2005. The bird looked like a female / immature of the species. Female capuchinos are not known to sing (Areta 2008); despite my many years of experience with capuchinos in the field and discussions with several bird-keepers, I have failed to find any evidence of females singing. Thus, birds singing structured male-like songs can be confidently considered as males (a temporally restricted and unstructured female song, very different from that of males, is known in Black-and-white Seedeater *S. luctuosa*: J. C. Eitniear *in litt*. 2007).

Without prolonged studies of marked birds, distinguishing between capuchinos displaying delayed plumage maturation, eclipse / winter plumage or paedomorphosis is problematic in the field. Although acquisition of full adult male plumage apparently takes 3–5 years in the capuchinos (Narosky 1977; pers. obs.), males usually show traces of adult plumage within one year and apparently do not start singing 'properly' until the end of their first year (R. Tato & P. Ferro pers. comm.). *Sporophila* species might be long-lived in relation to their small body sizes. For example, the oldest White-collared Seedeater *S. torqueola* reported was 11 years and eight months (Klimkiewiez & Futcher 1987 *fide* Eitniear 1997) and captive individuals of Double-collared Seedeaters *S. caerulescens* were reported to live up to 18 years (Sick 1997). Although the natural lifespan of most capuchinos is unknown, judging from the time necessary to reach adult-patterned plumage, and from colour intensities and colour patterns of birds observed in nature, it is likely to be above seven years (and probably >10 years) (pers. obs.).

Few data are available on the sequences of plumage development in the capuchinos, however delayed plumage maturation, although occasionally noted in *S. ruficollis*, is apparently not common in the group. The *S. ruficollis* and *S. palustris* reported herein behaved territorially, vocalised like adult-plumaged males and careful observation failed to detect any sign of incipient maturity in their plumages. This suggests not only protracted retention of the immature plumage, but also raises the possibility that it is retained throughout the life of the birds concerned, as in the two confirmed cases reported here for *S. ruficollis*.

The individual ontogenetic potential of creating, in the long term, paedomorphic populations is present in the capuchinos, at least in *S. ruficollis* and apparently also in *S. palustris*. Indeed a whole taxon of the clade, the subspecies *crypta* of Capped Seedeater *S. bouvreuil*, restricted to Rio de Janeiro, Brazil, can be considered paedomorphic: males never acquire a plumage obviously different from females and only show a few intermingled black crown-feathers and pale chestnut body-feathers. These few feathers suggest the derivation of *crypta*, by retention of immature plumage, from the black-crowned and chestnut-bodied *S. b. bouvreuil* (Sick 1967, 1968, 1997). Thus, the intra-populational phenomenon of immature plumage retention in *S. ruficollis* and apparently in *S. palustris* provides a mechanistic explanation for the evolutionary origin of paedomorphosis in *S. b. crypta*. The highly variably plumaged Temminck's Seedeater *S. falcirostris* exhibits a very protracted period of plumage maturation, and some captive individuals were reported never to reach a plumage different from that of immatures (Sick 1997), suggesting that protracted plumage maturation can lead to paedomorphosis within a species (but see Björklund 1991). Another case in which paedomorphosis might be partially invoked as a generative explanation is in the slightly dimorphic Drab Seedeater *S. simplex*, where some males show traces of a blackish-patterned throat and greyish back recalling those found in the Parrot-billed Seedeater *S. peruviana*.

In another Neotropical seed-eating genus, both sexes of Dull-coloured Grassquit *Tiaris obscurus* look like typical immatures / females of the genus *Tiaris*, unlike congenerics in which males are usually either mostly black or possess yellow and olive plumages (Sick 1967, Restall *et al*. 2006). The deep phylogenetic position of *T. obscurus* within *Tiaris* (Lijtmaer *et al*. 2004) suggests that this species' male plumage might have originated through the evolutionary retention of immature plumage from a male ancestor of a sexually dichromatic species.

These apparently independently evolved instances of paedomorphosis in Neotropical seedeaters demand further investigation, and provide a suite of cases to elucidate the evolutionary significance, developmental pathways, ecological factors and other conditions that lead to the appearance and maintenance of paedomorphosis in birds. Regardless of the mechanism behind their origin, the cases reported here represent the loss of obvious colour dimorphism in males of usually dichromatic taxa (*cf.* Price 2008 and references therein). The protracted plumage changes of *Sporophila* seedeaters through life indicates that colour intensity and plumage patterns can be considered true signals of age, with less colourful males usually being younger birds with less breeding experience. Although no male *Sporophila* seedeaters are known to incubate, many males share some nest duties and fledgling care with their females, and in some species males even mate-feed and brood nestlings (Facchinetti *et al.* 2008 and references therein). Whilst cryptic male coloration might enhance breeding success (e.g., improved brood care through reduced predation risk or fewer disputes with other males), it could also diminish male reproductive performance (e.g., if females and males are using colour to evaluate male aptitude and for species recognition). Among other possible causes (Badyaev & Hill 2003), these natural history and other features, together with detailed phylogenetic studies, might be important to explain the loss of obvious sexual dichromatism in *Sporophila.* On purely ontogenetic grounds, the cause of such a loss of pigmentation should be sought in the genetic control of pigment deposition in feather follicles (e.g. Mayr 1931), and their study should prove enlightening to establish plumage homologies. The theoretical framework and vocabulary developed for the understanding of plumage maturation (e.g., Humphrey & Parkes 1959, 1963, Rohwer *et al.* 1980, Foster 1987, Thompson & Leu 1994, 1995, Howell *et al.* 2003) provide several lines of thought that could be fruitfully applied to the problem of paedomorphosis. Although Sick (1967) frequently referred to *S. b. crypta* as a 'hen-feathered race' of feminised plumage, this assertion suggests that he might have concurred with my view that it could have evolved through the simple retention of juvenile / immature characters along pre-existing developmental pathways. Additionally, retention of winter plumage could be responsible for the observed female-like breeding males. Since females, immature and winter-plumaged males are extremely similar in *Sporophila,* all these explanations require thorough testing. Further clarification of the details of plumage ontogeny, homology and evolution in *Sporophila* depends upon carefully designed and repeated observation of plumage development in the same individuals over long periods. Such observations are needed to firmly establish the homology of retained paedomorphic plumages to those of earlier ontogenetic stages proposed in this study.

In sum, all of the cases discussed here suggest that paedomorphosis could be an important factor in the evolution of *Sporophila.* However, given our scant knowledge of the phylogeny and moults in *Sporophila* and the vexing similarity of different plumages at different ages and seasons within a species (and even between different species), plumage homologies cannot be firmly established. Paedomorphosis must remain a plausible, but to date not satisfactorily tested, explanation for some of the plumage diversity of *Sporophila* seedeaters.

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Was Mascarene Grey White-eye *Zosterops borbonicus* introduced to Madagascar?

by Anthony Cheke

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SUMMARY.—A previously ignored or misinterpreted report from the 1830s of Mascarene Grey White-eye *Zosterops borbonicus* being introduced from Réunion to Île Sainte-Marie off north-east Madagascar is shown to be valid, based on the evidence of the original paper (Sganzin 1840) and the discovery of a specimen from Madagascar collected by Sganzin in 1831. There is evidence that the species was also introduced to Nosy Be (off north-west Madagascar) in the mid-19th century; it no longer survives at either locality.

Mascarene Grey White-eye *Zosterops borbonicus* is endemic to Réunion and Mauritius in the Indian Ocean, each island having a form generally considered a subspecies (Gill 1973, Warren *et al*. 2006), but sometimes treated as sibling species (e.g. Sinclair & Langrand 1998). Mauritian *Z*. (*b*.) *mauritianus* is grey above with a white belly, whereas nominate *Z*. (*b*.) *borbonicus* on Réunion possesses a range of plumage variation separable into four colour morphs (Gill 1973), grey or brown above, and generally grey (pale to dark) below. All forms have a conspicuous white rump. The species is common on both islands, and, unlike most native forest passerines, readily occupies anthropogenic habitats (Cheke 1987, Barré *et al*. 1996). It is well known to most inhabitants, and indeed was often eaten in the 19th and early 20th centuries (Schlegel & Pollen 1868, Lantz 1887, Milon 1951). Here I argue that birds from the French colony of Réunion were introduced to French-controlled islands off Madagascar in the 19th century. Where scientific names are cited from 19th-century usage, they are given in single quotes.

Sganzin's observations

In 1831 Victor Sganzin (1840) travelled from France via Réunion to become military governor of Île Sainte-Marie (=Nosy Boraha), off north-east Madagascar, which had been a French outpost since 1818 (Pitcher & Wright 2004). He remained there until 1832 (Rand 1936), observing and collecting mammals and birds in addition to conducting his official duties, reporting these in the first formal scientific paper published by a European visitor to have collected Malagasy wildlife in the field (Sganzin 1840). Amongst birds, he reported having collected on Sainte-Marie the 'petit simon de Buffon', i.e., if he identified it correctly, the Réunion race *borbonicus* of the white-eye (Cheke 1983). Furthermore, he believed, following Buffon (1770–83), that the species was not native to Réunion but had been introduced from Madagascar. He gave the bird's local name as 'thzeiri', and considered it quite rare on Sainte-Marie, unlike his 'chéric' (taken from Buffon 1770–83) or 'ramanzeri', i.e. the Madagascar White-eye *Z. maderaspatanus*, which he described as common. Richardson (1885, 'ramanjereky') and Langrand (1990, 'ramanjereka') confirm usage of similar names for the native white-eye, though Pollen reported 'souy' (Schlegel & Pollen 1868).

Subsequent workers appear to have ignored this record or considered Sganzin mistaken. The local name 'thzeiri' appears to be a variant of Brisson's (1760) 'tcheric' for *Z. maderaspatana* (the source of Buffon's 'chéric'), and even more closely resembles the name 'tséré' reported by Cowan (1881) and Richardson (1885) as in use by the Betsimisaraka tribe for Common Jery *'Eroessa'* (=*Neomixis*) *tenella*, a bird undescribed in Sganzin's day. 'Jery' is the current transliteration, used for all three modern segregates of *N. tenella* (e.g. Langrand 1990, Morris & Hawkins 1998). Indeed, apparently based on his use of 'thzeiri', but without explanation, Sharpe (1883) and Milne-Edwards & Grandidier (1885) assumed that Sganzin's 'petit simon' was *Neomixis tenella*, although Hartlaub (1866) mentioned neither Sganzin nor the local name in formally describing the genus and species from specimens collected by Edward Newton. Grandidier, collecting with Lantz (see below) in 1865–67, likewise made no mention of Sganzin in connection with *'Eroessa tenella'* (Grandidier 1867–68). Schlegel & Pollen (1868) and Hartlaub (1877) included Sganzin in their bibliographies, but not in discussing *'Eroessa tenella'* or *'Zosterops borbonica'*[1].

The assumption that Sganzin was referring to *Neomixis* appears to have effectively buried the record and prevented its re-appraisal. But did Sganzin misidentify the bird? Whilst no other bird in Sganzin's paper can be identified as a jery, *Neomixis* do not resemble *Z. borbonicus* in anything but size, and lack the conspicuous white rump. Another candidate, also without a white rump, might be a *Newtonia*, but Sganzin's 'souis gris' may represent this species-group, though the eye colour he cited is wrong. A grey *Newtonia* on Île Sainte-Marie can only be Common Newtonia *N. brunneicauda* (Goodman 1993). As Schlegel & Pollen (1868) noted, 'souy' is a generic Malagasy term for sunbirds, white-eyes and similar species. It is probable that the names 'thzeiri' / 'tséré' / 'tcheric' were (are?) also applied fairly indiscriminately to all small warbler-like passerines and cannot be considered species-specific; indeed, Richardson (1885) listed numerous synonyms for jerys, white-eyes and 'warblers'. Given the non-specificity of local names, and that Buffon's description to which Sganzin referred his specimen (see appendix) does not match any jery, there is no reason to uphold Sharpe's and Milne-Edwards & Grandidier's view, generally accepted since by default, that the bird was *Neomixis tenella*.

As Sganzin had visited Réunion, where *Z. borbonicus* is common, he should have been familiar with it before he reached Saint-Marie. Mentioning 'Bourbon' (=Réunion) as well as Madagascar in connection with the 'petit simon' suggests that he had probably also seen it there: for other species he only mentioned Réunion or Mauritius if he had noted them there, as well as on Madagascar. As he denied having seen on Madagascar Buffon's 'figuier bleu' (in part *Z.* (*b.*) *mauritianus* (Cheke 1983) but alleged by Buffon to be from Madagascar), his bird presumably did not resemble the white-bellied Mauritian form[2]. Regrettably he did not describe his 'petit simon' specimen (see appendix), referring instead to Buffon's (1770–83) description, which despite being otherwise accurate did not mention the white rump, though it is clearly evident in Martinet's plate (*Planches Enluminées* 705: 2) which is referred to in the description. In general Sganzin's paper was strongly influenced by having read Buffon after returning to France, to the extent of emulating his style and very inconsistent usage of Linnaean binomials; however, at the time, Buffon's encyclopaedias were the only ready source on Malagasy fauna.

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[1] *Zosterops* was, until 1974, considered feminine, hence 19th-century authors always cited its specific names in feminine form.

[2] Any inference from the 'figuier bleu' is possibly compromised, in that Buffon, Sganzin s only acknowledged source apart from his own observations, thought that the birds illustrated in plates 705: 1 and 705: 3 represented female and male of the same species. While 705: 1 is indisputably a *Z.* (*b.*) *mauritianus* and is indeed its lectotype (Cheke 1983), 705: 3, labelled 'figuier de Madagascar' in the *Planches*, is a grey bird with a white-edged, rather long tail (unlike the white-eyes), lacking a white rump, and resembles no known Malagasy species. In fact it is the lectotype of *'Motacilla livida'* J. F. Gmelin, Tropical Gnatcatcher from Middle and South America (now *Polioptila plumbea*; see Penard 1923), although the plate appears to my eye to resemble more closely Blue-grey Gnatcatcher *P. caerulea*. Nonetheless, since plate 705: 1 is a grey white-eye from Mauritius, and Sganzin denied having seen it, it is likely he recognised the bird he collected as the Réunion form (illustrated on the same *Planche* as 705: 2).

Malagasy specimens in Paris

The internal evidence in the paper, whilst strongly indicative, does not prove that Sganzin collected *Z. borbonicus* on Île Sainte-Marie. There the matter might have rested, but for the fact that Sganzin's specimen of *Z.* (*b.*) *borbonicus* survives in the Muséum Nationale d'Histoire Naturelle (MNHN), Paris, labelled 'pouillot gris—Madagascar', and dated 1831. There is no collector's name on the label, but the monogram 'VS' (i.e. Victor Sganzin) appears twice (J.-F. Voisin *in litt.* 2008), and there is also a number (236) on the reverse (pers. obs.), presumably referring to a specimen list. No such list survives (A. Préviato *per* J.-F. Voisin), but Sganzin (1840) stated that he had donated his most important Malagasy specimens to the Paris museum (*cf.* Valenciennes 1832), though he also gave 17 bird skins (not listed) to the natural history society in Mauritius on his return journey (Desjardins 1832).

There is a further Malagasy specimen of *Z.* (*b.*) *borbonicus* in MNHN, from a collection by Auguste Lantz received in 1868, and labelled 'Nossi Bé' (=Nosy Be, off north-west Madagascar), another island where the French long had a presence (from 1841: Pitcher & Wright 2004). Lantz was curator of the natural history museum in Réunion, which island served as the French base for colonial adventures in Madagascar, where Lantz frequently collected (Andriamialisoa & Langrand 2003). He was an exemplary collector and extremely unlikely to have made a locality error with a species so familiar from Réunion. Curiously, in their history of zoological exploration in Madagascar, Andriamialisoa & Langrand (2003) made no mention of Sganzin.

There appears to be no trace of these putative introductions in the subsequent literature (pers. obs.; R. Safford pers. comm.), and Pollen (Schlegel & Pollen 1868: 76) commented that he had never seen Grey White-eyes in Madagascar; he collected in 1864–66 mainly on Nosy Be (where he clearly did *not* find the species) and in north-west Madagascar, but apparently spent little or no time on Île Sainte-Marie. Mascarene Grey White-eye is certainly absent from Sainte-Marie today, as are *Neomixis* species, though *Newtonia brunneicauda* is still present (Goodman 1993). However, the island has been heavily deforested since Sganzin's day (Goodman 1993). Equally, there are no subsequent reports from Nosy Be (R. Safford pers. comm.). Surprisingly, only eight bird species are recognised as having been successfully introduced to Madagascar and its islands (Hawkins & Goodman 2003), in contrast to the numerous introductions on the region's oceanic islands (Skerrett *et al.* 2001, Hawkins & Goodman 2003, Cheke & Hume 2008).

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Roger Safford's helpful comments and suggestions are much appreciated, as are those of David Wells and the editor. Jean-François Voisin kindly re-examined the Sganzin specimen for me, and Anne Préviato searched hard, albeit fruitlessly, for documentation of Sganzin's collections. Christian Jouanin facilitated my visit to the MNHN in 1976; I have only recently rediscovered my contemporary draft on which this note is based.

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Appendix. Sganzin's text (1840) on the 'petit simon', 'chéric' and 'soui gris', and Buffon's description of the 'petit simon' (translated by ASC)

p. 27. Le Cheric, Buffon (*Ramanzeri* à Sainte-Marie)

See Buffon for the description of this species. These birds fly in groups and eat insects. They pair up in the mating season, but otherwise live solitarily. They are tame and allow close approach. They are found in the forests and are common at Sainte-Marie, where they are known by the name of *ramanzeri*.

p. 28. Le Petit Simon de Bourbon, Buffon (*Thzeiri, madag.*); le *Figuier* de Madagascar

This bird is called *petit simon* on Bourbon Island [=Réunion], but is not native. It is naturalised there after having been brought from Madagascar. I obtained one at Sainte-Marie, where is it rather rare and known by the name of *thzeiri*. I have nothing to add to the description given by Buffon.

p. 30. Le Souis Gris

This bird, a little larger than the next one[3], has ash-grey plumage, the tail tending to dark rusty colour. The beak is black, prominent and slightly down-curved. The feet are black; the eye is brown[4]. I was able to obtain this bird only once on Sainte-Marie.

Buffon (1770–83, original edition, vol. 5, pp. 280–81: Le Petit Simon*, third species [of 'figuier']
*See the *Planches Enluminées* 705, fig. 2, under the label 'figuier of Madagascar'. This bird is called 'petit simon' on the isle of Bourbon, but is not native to that island, and it must have been carried there from elsewhere, as we are informed by the reports of very reliable persons, and particularly those of M[onsieur] Commerson, that there were no quadrupeds or birds on the isles of Bourbon and of France [=Mauritius] when discovered by the Portuguese[5] . . . This bird is precisely the same size as the previous one [the 'chéric']; its upperparts are a clear slate colour, the underparts whitish grey, the throat white, the tail feathers dark brown narrowly edged with slaty, the beak brown, pointed and tapering, the feet grey and the eyes black[6], females, and even the young, have more or less the same plumage as males. It is found everywhere in large numbers on the Isle of Bourbon . . .

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[3] The subsequent bird on Sganzin's list, his 'soui à collier bleu', is, from the adequate description, Souimanga Sunbird ***Nectarinia souimanga***.

[4] All *Newtonia* species have white or pale yellow irises (Sinclair & Langrand 1998).

[5] This is nonsense, see e.g. Cheke & Hume (2008).

[6] The irides are deep chestnut.

First breeding data for Roraiman Nightjar *Caprimulgus whitelyi*, from south-east Venezuela

by Anthony Crease

Received 12 August 2008

Summary.—Observations were made at a nest of the poorly known Roraiman Nightjar *Caprimulgus whitelyi*, in bushy savanna at 885 m elevation, near El Paují in the southern Gran Sabana, Venezuela, from 14 days prior to hatching on 16 March 2008, until the fledgling and adults vacated the site. I present the first description of the nest, single white egg, chick and fledgling, as well as notes concerning the identification and behaviour of the adults and juvenile. Both adults incubated and tended the young. The fledgling became active and relocated from a nearby day roost to the nest just before the first of several feeding visits by the adults after dark, greeting their arrival with begging 'warbles'. Otherwise, the birds hardly vocalised at all during the entire period.

Roraiman Nightjar *Caprimulgus whitelyi* is a rare, local and poorly known species (e.g. Cleere 1998, 1999, Hilty 2003, Restall *et al*. 2006). No information on its behaviour is available. A recent molecular study (Han 2006) suggested that *C. whitelyi* is not closely related to any other *Caprimulgus*. Endemic to the Pantepui with records from forested slopes and upper levels of the southern tepuis of Venezuela (Hilty 2003), including Cerro Urutaní on the frontier with Brazil (Dickerman & Phelps 1982, Naka *et al*. 2006), at 1,280–1,800 m, it has more recently been found in bushy savanna near forest, at *c*.850 m, in Las Agallas in the southern Gran Sabana of Venezuela (D. Ascanio *in litt*. 2008) and near Kopinang in central-west Guyana (O'Shea *et al*. 2007). For seven weeks in March / April 2008, I made daily observations of *C. whitelyi* breeding at a site <1 km south of El Paují (04°28'N, 61°35'W) in the southern Gran Sabana. Most of my observations were made in daylight.

Initial discovery

The presence of Roraiman Nightjars was drawn to my attention by A. Rønnevik, the owner of a nearby house, who first saw them in March 2007. Due to travel commitments, I was only able to make brief observations of an adult male (Fig. 1) and just-fledged juvenile. On my return in early May, they were no longer present, but on 2 March 2008, a pair was back in exactly the same place and was found to be incubating an egg.

Breeding site and habitat

El Paují village lies within an irregular strip of savanna, 3–6 km wide by *c*.60 km long, with a maximum elevation of 1,050 m, surrounded by forest. The breeding site lies between gallery forest and the village airstrip, *c*.250 m further south, at 885 m. Shallow sandy soil of variable depth covers sandstone rock and supports a mosaic of grass, in stiff clumps, and bushes up to 3 m tall, mostly *Bonnetia sessilis* (Bonnetiaceae), which is common in the area to 2,200 m (P. Perret *in litt*. 2008). The airstrip and the dirt road from the village to the strip protect the breeding site from occasional savanna fires. The egg was laid *c*.40 cm to the east of the base of a relatively old *Bonnetia sessilis* comprising *c*.100 thin stems emerging from a wide base. The root mass is raised above puddles that form during heavy rain, whilst the bush and its broad base afford shade from midday to sunset, and protection against intrusion from the west. The single egg was placed immediately adjacent to a *c.*30 cm patch of white quartzite stones, perhaps for camouflage. Dead *Bonnetia* leaves and twigs were scattered throughout, sometimes forming small banks. No nest was constructed, not even by removing larger debris from the area where the egg was laid, and the egg was in fact moved around within a radius of 10+ cm. To the east was a *c.*10-m clear area with a low bush on its far side with protruding dead branches used by the nightjars when approaching the site. A surprising feature is the site's proximity to two houses, one at *c.*80 m and the other *c.*200 m distant, with attendant noise and domestic animals.

Identification notes

The continuous presence of the adults during seven weeks permitted ample opportunity to study and photograph both them and the juvenile, at rest and in daylight. Although good descriptions are available (Cleere 1999, Hilty 2003, Restall *et al.* 2006), I offer a few additional characteristics based on my observations. Although the base colour of *C.whitelyi* is considered near black based on museum specimens, even darker than *C. nigrescens* (N. Cleere *in litt.* 2008), in the field the apparent colour varies from near black to brown, depending on the lighting and as shown by comparison of Figs. 2 and 3. When the adults are alert, the head is lifted and the neck feathers are raised revealing the collar, which is more prominent (Figs. 1–2) than described in the literature. The large pale tips to the male's wing-coverts appear to be arrayed in four 'curved' lines, suggesting a fourth set of coverts (Fig. 2). No other dark nightjar in range has uniform buff undertail-coverts. This feature, which is present in both sexes and even in fledglings (Fig. 1), is therefore diagnostic. On the ground, the buff sides to the undertail-coverts can be seen when the bird perches (Fig. 2). The white spots on the inner webs of the second and third rectrices are noticeable on perched birds from below (Fig. 1), and occasionally from above when the rectrices are fanned (Fig. 4) or displaced.

Egg

The single all-white egg measured 27.5 mm × 21.0 mm and was only slightly blunter at one end (Fig. 3). Some indistinct, small, pale brown spots of somewhat variable size, sparsely scattered over most of the surface, proved to be marks from ground contact (being removable by washing) rather than pigmentation.

Incubation rhythms

Both adults incubated the egg. Despite carefully searching for the second adult near the nest, I never saw one; it presumably spends the day roosting some distance away. The nest was visited several times on some days and the same bird was always present during daylight on any given day. In fact, daytime incubation shifts were three or more days long, as follows: male: 3; female: 5; male: 3; female: 3+ (hatching occurred on the third day and the female tended the chick for some days more). The 'on-duty' adult appears to take up position shortly before dawn. Once, at 05.20 h, before there was enough light to see, flight noise was heard from the vicinity. On another day, the egg was found unattended at 05.31 h, but the male arrived and commenced incubation within <2 minutes. This was the only time in 20 visits that the egg was found uncovered.

Response to disturbance

The incubating adult appears, in general, to remain completely immobile throughout the day, with eyes closed. The only response to quiet approach was to progressively open the eyes wider, from a slit when the observer was 10 m away, to almost round at 1 m. No type of threat behaviour was adopted, except by the female, which raised its wings and revealed the huge pink gape when I collected the eggshell halves soon after hatching. If flushed, the adult usually flew *c.*8 m, to an area north-east of the nest, near a line of bushes. On alighting, it would tilt forward and extend the wings briefly, apparently feigning injury, and occasionally emit a low, soft warble, the throat visibly vibrating as it did so. On my withdrawing a few metres, the bird would soon walk laboriously back to the egg (Fig. 2), with occasional rests. Once an adult made a short flight when returning, but landed *c.*1 m away and made the final approach on foot (Fig. 3).

Hatchling

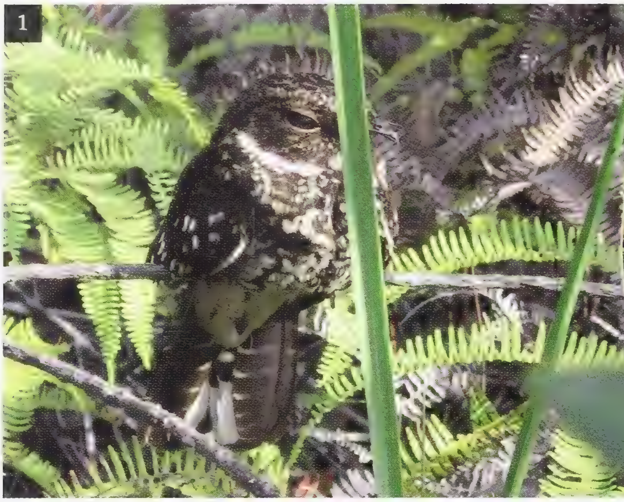
Hatching occurred on 16 March 2008, probably around 10.30 h, on a dry morning. The semi-altricial hatchling was found, with the female (Fig. 4) close by, at 11.20 h, covered in white down, still damp with amniotic fluid (Fig. 5). The eyes were not seen to open during this first visit. On day 4 (after hatching), the hatchling had its eyes open after I flushed the female, which had been brooding it during preceding visits in the intervening period.

Chick growth

The female was found brooding the chick on all visits subsequent to the first, until day 6. On day 7, ten minutes after a rain shower, the female was found *c.*30 cm from the chick. The female continued in daytime attendance until day 8, the male on days 9–14, sometimes brooding, sometimes not (Fig. 6). On day 14 the chick had moved *c.*1 m from the nest. On day 15, the chick was found with the female *c.*5 m west of the bush, in an area of younger, thinner *Bonnetia sessilis* bushes, which the chick continued to frequent on most subsequent days. On day 16, the male was back in attendance and remained so until day 29. On days 18–19, the by now quite large chick was found under the male's wing, facing rearwards. Day 19 was the last on which I observed the male brooding the chick. Thereafter, the birds were found separated by just a few cm or up to 5 m, at the base of the original bush or under the thinner bushes to the north-west. It is noteworthy that the shared attention to the egg and chick by both adults differs from the behaviour of some other Neotropical nightjars, e.g., Pauraque *Nyctidromus albicollis*, Blackish Nightjar *Caprimulgus nigrescens* (J. Ingels *in litt.* 2008) and Lyre-tailed Nightjar *Uropsalis lyra* (Greeney & Wetherwax 2005).

From day 30, the chick spent the day alone on the ground, mostly among the thinner bushes, with no sign of the adults. On days 32–35, I made observations of the fledgling and adults immediately after nightfall as follows.

Day 32.—On approaching the site at 17.12 h, I inadvertently flushed the fledgling, which made a short (*c.*7 m) flight to the nest. As the flight was controlled and direct, it is probable that the adults left the young alone during the day only after it could fly. This would place fledging prior to day 30 and perhaps well before as, for example, fledging at day 14 is reported for *Caprimulgus nigrescens* (Cleere 1998). On landing the young resumed its usual, immobile, daytime position. At *c.*17.35 h, just before sunset, but with less light than normal due to heavy cloud cover, the young suddenly became much more active, moving the eyes and eyelids, producing a 'nibbling' action of the bill, rapidly twisting the entire head (apparently tracking flying insects), head-bobbing, 'yawning', sideways rocking and wing-stretching. Once it shuffled to a bank of dead leaves, recently wetted by rain, and spent several minutes taking them deeply into its gape, then 'spitting' them out, presumably to obtain water. When inclining forward to select leaves, I noticed that the undertail-coverts were already buff like the adults.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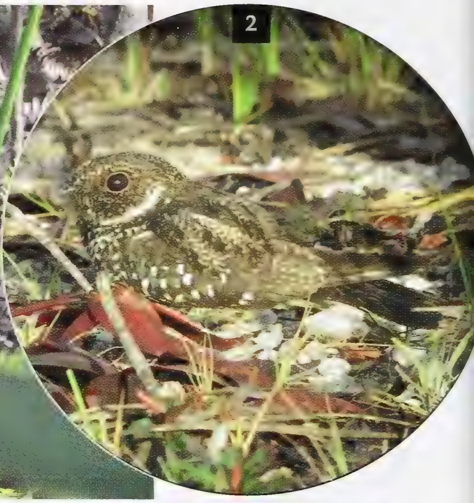
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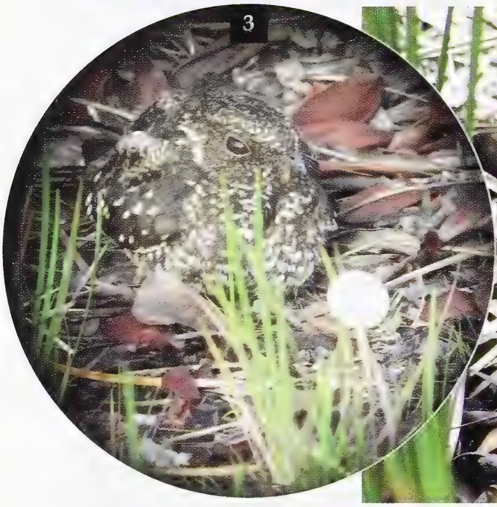
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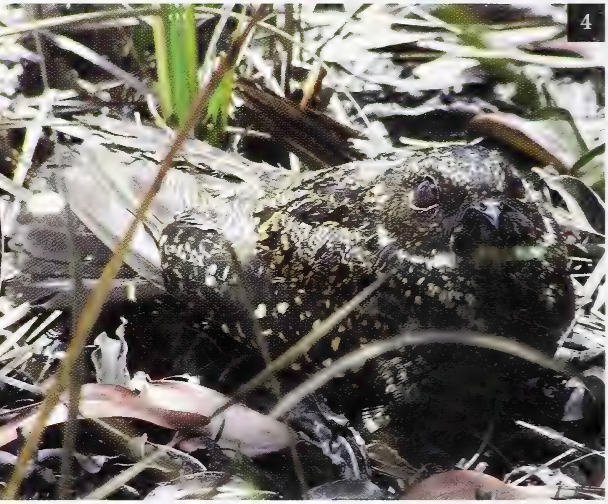
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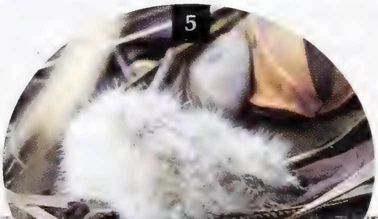
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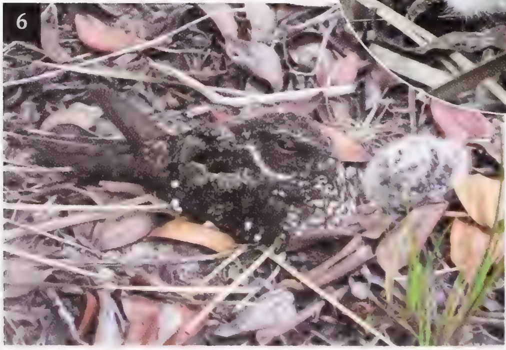
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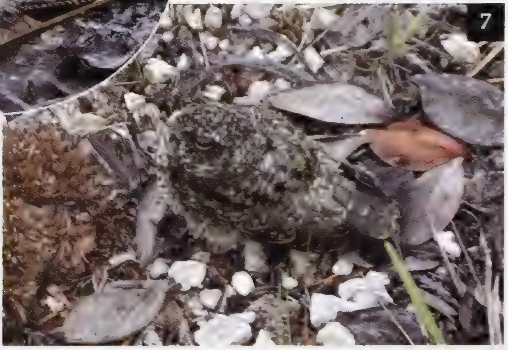
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At *c.*18.00 h, the male, identified by the relatively long tail spots, fluttered *c.*3 m above the fledgling and uttered two short bouts of 3–4, rather chicken-like, whistled *cheeps*, the first vocalisations I had heard from the birds. The fledgling responded with soft warbles, initially inaudible and only evidenced by the vibrating throat, but becoming clearly audible when an adult approached closely. As direct torchlight appeared to cause the fledgling to revert to its inactive daytime mode, I shifted the beam slightly away from the bird, whereupon it became very active, stretching the wings and, during a low pass by an adult, taking laboriously off almost vertically upwards, moth-like, with the wings held high and beating rapidly, to *c.*2.5 m, before descending to a rather 'uncontrolled' landing on a grass tuft. While airborne, the adult circled buoyantly around it, apparently providing encouragement. The adult was evidently keen to deliver food, but was unwilling to do so because of the light and my presence. The young then made another take-off in my direction but the adult appeared and seemed to 'steer' it to a landing *c.*10 m away, behind a bush. Here the adult landed beside it and commenced feeding. My observations then ceased for the night.

Day 33.—I approached the site 17 minutes before sunset and again flushed the fledgling before seeing it. This time the young flew *c.*25 m and, after I flushed it again, flew back to *c.*10 m north-west of the nest. At 21 minutes after sunset, but with considerably more light than on day 32, the fledgling became more active, behaving similarly to the day before. Four minutes later, it stood up, defecated, wing-stretched and head-bobbed, and then flew to the nest. At 37 minutes after sunset, an adult, probably the female as no obvious white was detected, flew over. The young responded with soft warbles. A few minutes later, it made a short hop onto a small rock, an adult flew over and the young followed it into the air and away through the tops of the nearest bushes and out of sight (in moth-like, hovering flight). On days 32–33, my presence clearly altered the usual pattern of feeding, which would presumably be for the adult to feed the young at the nest.

Day 34.—This night I hung my recorder from the bush above the nest before sunset and switched it on. Visibility was unusually good due to the absence of cloud and a near-full moon, and I could remain further away, *c.*10 m from the nest, and still observe some detail without torchlight. The young was alone at the same location as on day 33. Thirteen minutes after sunset, the young became active, stood, defecated, started walking toward the nest and then flew the rest of the way. It made a short visit to the leaf pile and, *c.*15 minutes later, made three buoyant flights over a circular route, which brought it back to the nest. At 36 minutes after sunset, I detected an adult overhead and the young warbled. The adult landed and I identified it as the female using the torch, causing the bird to flush to a dry branch near the top of the favoured bush *c.*10 m east of the nest and closer to me, without

Captions to figures on opposite page:

Figure. 1. Male Roraiman Nightjar *Caprimulgus whitelyi*, showing buff undertail-coverts and long white spots on inner webs of middle rectrices, El Paují, Bolívar, Venezuela, 2008 (Anthony Crease)

Figure 2. Male Roraiman Nightjar *Caprimulgus whitelyi* returning to egg after being flushed, El Paují, Bolívar, Venezuela, 2008 (Anthony Crease)

Figure 3. Male Roraiman Nightjar *Caprimulgus whitelyi* with egg, El Paují, Bolívar, Venezuela, 2008 (Anthony Crease)

Figure 4. Female Roraiman Nightjar *Caprimulgus whitelyi* (soon after hatching of chick); note small spot in fanned tail, El Paují, Bolívar, Venezuela, 2008 (Mathias Gonzales)

Figure 5. Hatchling Roraiman Nightjar *Caprimulgus whitelyi*, when one-hour-old, El Paují, Bolívar, Venezuela, 2008 (Mathias Gonzales)

Figure 6. Male Roraiman Nightjar *Caprimulgus whitelyi* with 11-day-old chick, El Paují, Bolívar, Venezuela, 2008 (Anthony Crease)

Figure 7. Fledgling Roraiman Nightjar *Caprimulgus whitelyi* at 36 days old, El Paují, Bolívar, Venezuela, 2008 (Anthony Crease)

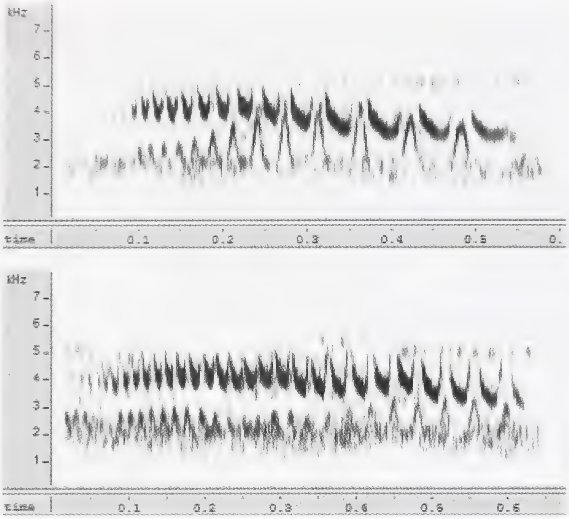

Figure 8. Sonogram depicting begging 'warbles' of fledgling Roraiman Nightjar *Caprimulgus whitelyi*, recorded at El Paují, Bolívar, Venezuela, 19 April 2008. Recorded by Anthony Crease using Olympus Digital Voice Recorder WS-331M with built-in microphone (sample rate 44,100 Hz, frequency range 50 to 13,000 Hz). Recording converted from .wma format to .wav format (sample size: 16 bit, bit rate: 352 kbps, sample rate: 22050 Hz) using iTunes software. Sonograms created using Wavesurfer software.

providing food. Five further visits by the adult occurred within the next ten minutes, mostly flights between the low bush and the nest and back, as if the bush was being used as a staging and surveillance post, which facilitated reaching the chick via the intervening clear area most expeditiously. Once I saw the adult in hovering flight for *c.*5 seconds, prior to alighting on the dry branch, with the wings held high and beating quickly. I presume that food was provided during each of the five visits, but I could not observe any details and was loath to use my torch. The number of feeds in the first feeding session of the night is similar to the 4–5 reported for Lyre-tailed Nightjar (Greeney & Wetherwax 2005). Six more or less long bouts of warbling were recorded on analysing my recording subsequently, corresponding to the initial and five successful feeding visits. It seems that the young begs by warbling each time it detects an adult nearby. The first bout of warbling lasted 36 seconds and included 16 warbles (Fig. 8). The longest and strongest warble was 0.55 seconds long and comprised 17 notes, reaching peak volume in the second half. The last bout (before I retired at 19.02 h) included only a single warble, presumably reflecting reduced hunger. This night, the young remained at the nest throughout, even when I retrieved my recorder from 80 cm above its head.

Day 35.—I left my recorder hanging over the nest at 17.30 h, withdrew and retrieved it at 19.20 h. On my first visit I spotted the fledgling, which did not flush, *c.*8 m north of the nest. At 19.20 h it was directly below my recorder; neither adult was seen. Strong warbling was recorded at 18.26 h (44 minutes after sunset), presumably when an adult first arrived. Twelve warbles were given in the space of 32 seconds, and 2.5 minutes later a single warble was uttered, probably signalling the second arrival of an adult with food. Surprisingly, no more warbling was recorded. Next day, 22 April 2008 (day 36), I took the last photographs of the fledgling, at 14.15 h (Fig. 7). On 23 April, the birds had abandoned the site and were not seen subsequently.

The pattern that emerges is that the parents fed the fledgling (and presumably the chick also) when it is dark, not in the crepuscular period, i.e. from 20 minutes after sunset on a dark, cloudy night to 45 minutes after sunset, and that the fledgling becomes active c.20 minutes before the commencement of feeding and moves some distance (up to 10 m), from the day roost to the hatching site, before a parent arrives with food.

Vocalisations

Apart from the begging warbles of the young, a few similar warbles or churrs were given by the adults on flushing and a few *cheeps* by the male on arriving to feed the fledgling and finding me present, but no other vocalisations were heard during the entire seven weeks. In particular, during my dawn visits, I heard nothing similar to the dawn vocalisation recorded in Guyana for *C. whitelyi* (O'Shea *et al.* 2007). It is probably that the birds are quiet when breeding, presumably to avoid drawing attention to their presence.

Plumage of fledgling

At 36 days old the fledgling's wings still extended just beyond the tip of the tail, compared to the adult in which the tail extends 0.5–1.0 cm beyond the wingtips. Fledgling plumage is highly cryptic with no visible white (Fig. 7). Base colour of all feathers is dark brown, darkest on the mantle, tipped, scaled and barred pale grey, buff and rufous. The breast and belly are covered by a dense 'apron' of dark-brown feathers with greyish- and buffy-white tips, producing a barred effect, and overlapping the leading edge of the closed wing. The undertail-coverts are buff.

Discussion

My observations confirm that the lower altitudinal limit of Roraiman Nightjar is lower (to below 900 m) than previously stated in the literature. Similarly, its habitat is confirmed to include savannas near forest, with grass and bushes. My observations have all been in areas of *Bonnetia sessilis*. It is probable that further details of the species' breeding could be established by a more intrusive approach to observation. However, for this first study, I was careful to minimise disturbance to obtain the general pattern of behaviour during an uninterrupted breeding cycle, and to avoid discouraging reuse of the site.

Acknowledgements

My thanks to Robin Restall and Johan Ingels who assisted with obtaining references. Ingels, and Nigel Cleere, provided invaluable reviews of the paper. I thank all of the generous people on the NEOORN list server who sent me references. Mathias Gonzales kindly permitted me to use two of his photographs. Above all, I thank my wife for her support during my dedication to the nightjars.

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Removal of Black Crake *Amaurornis flavirostris* from the Western Palearctic list, and the first record of Lesser Moorhen *Gallinula angulata* for Madeira

by Rafael Matias

Received 24 May 2008

SUMMARY.—Here I describe the rediscovery of a forgotten specimen originally identified as a Black Crake *Amaurornis flavirostris*, collected on Madeira in January 1895, the sole record of this species for the Western Palearctic. However, the specimen was reidentified as a Lesser Moorhen *Gallinula angulata*, the first record for Macaronesia, and the fourth for the Western Palearctic.

Black Crake *Amaurornis flavirostris* occurs throughout sub-Saharan Africa, where it generally is a common resident, which undertakes only local movements (Urban *et al*. 1986). The northernmost limit of its range is south-west Mauritania (Borrow & Demey 2001). There is a single record for the Western Palearctic, a male collected on Madeira (at Santo Amaro, near Funchal), on 29 January 1895 (Cramp 1980).

The specimen was prepared by Padre Ernesto João Schmitz and originally formed part of the ornithological collection of Funchal seminary (Museu do Seminário do Funchal, MADS). Translated from the German (Schmitz 1896), its discovery was described thus: '26 January 1895: today I received a bird recalling a Moorhen but much smaller; can it be a Spotted Crake [*Porzana porzana*]?' Three years later, Schmitz (1899) included *Limnocorax niger* (*Amaurornis flavirostris*) on his list of the birds of Madeira, writing: 'The first and only time this bird was collected was on the 26.1.1895. It was a male and was caught in S. Amaro'. Both accounts refer to the same individual, as no other birds were caught on that date according to Schmitz's writings. Seventy years later, Bannerman & Bannerman (1965) wrote: 'This record is very unexpected, but in view of the data published by Padre Schmitz [. . .] we must undoubtedly accept it as a genuine vagrant from the west coast of Africa [. . .] If it was preserved at one time in the Seminário Museum, the skin has been lost.'

Schmitz (1845–1922) was a prominent naturalist of the time. Of German birth, he first came to Funchal, Madeira, as a chaplain in 1874, became established in 1878 and took Portuguese citizenship thereafter. He left Madeira in late 1908, never to return, going to Jerusalem and then Haifa, where he died (Silva & Menezes 1940). Especially between 1882 (when he founded the Museu do Seminário do Funchal) and 1908, he gathered much important information on the birds of the archipelago, building up a collection of hundreds of specimens. This included the first proof of breeding for Zino's Petrel *Pterodroma madeira* (although not recognised as such at the time: Zino & Zino 1986) and records of many new taxa for Madeira (e.g. Schmitz 1899, 1903; see also Zino *et al*. 1995).

The collection was originally housed at the Museu do Seminário do Funchal, but after Schmitz left Madeira the entire collection (and museum) was moved several times (until 1982), and for a period its whereabouts appear to have been uncertain, but probably in warehouses belonging to the church (Silva & Menezes 1940; R. Jardim *in litt*.). This may explain why D. A. Bannerman never got to see Schmitz's specimens as, in his work on the birds of Madeira, he states that 'they had been allowed to fall into decay. The majority indeed seems to have perished. [. . .] Its loss is a sore blow' (Bannerman & Bannerman 1965).

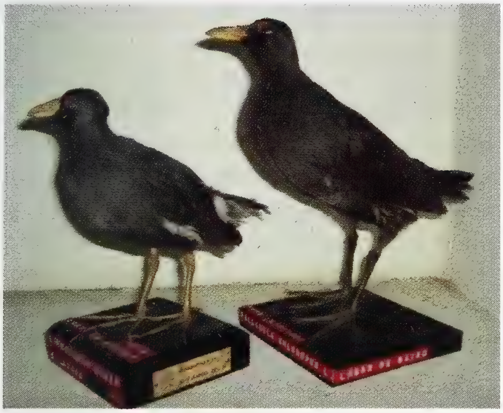

Figure 1. Comparison of the Lesser Moorhen *Gallinula angulata* specimen from Madeira, with a Common Moorhen *G. chloropus* from the same collection (MADS-a262) (Rafael Matias)

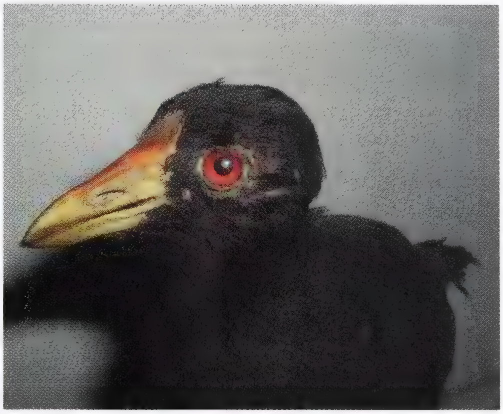

Figure 2. Detail of the head of the Lesser Moorhen *Gallinula angulata* specimen, showing the distinctly wedge-shaped frontal shield and the bill's colour (Rafael Matias)

By the early 1980s, although a large part of the collection still existed, it was poorly conserved. Because of this, the remainder was sent to the Museu do Jardim Botânico do Funchal, in 1982, where it remains. The collection is still the property of the Diocese of Funchal. The bird specimens presently held in the Museu do Jardim Botânico have been inexplicably neglected by researchers, but a catalogue of the collection is currently being prepared by the author.

On a visit to the Museu do Jardim Botânico do Funchal, on 1 June 2007, a few mounted specimens immediately caught my eye. One was a small rallid, recalling a tiny Common Moorhen *Gallinula chloropus*, but clearly an adult Lesser Moorhen *G. angulata* (Figs. 1–2). The specimen could be seen only through the cabinet window and it was not possible to see the original tag, only a more recent red plastic label attached to the wooden base that stated 'Corvo do charco, 29–01–1895'. On a second visit, on 10 September 2007, I was able to examine the original tag, from the seminary collection, which states '*Limnocorax niger* (Gm.) male, S. Amaro 26.1.95'. It is therefore straightforward to conclude that the specimen is the same referred to as the first and only Black Crake for the Western Palearctic, and thought to be 'lost' (Bannerman & Bannerman 1965, Cramp 1980). A full description and series of photographs were taken.

Although much smaller, the bird's general shape recalls that of a Common Moorhen, but with a proportionately larger head and shorter legs (Fig. 1). Bill yellow with a reddish culmen from the frontal shield to the bill tip, and proportionately shorter and more robust than *G. chloropus*. The frontal shield is distinctly wedge-shaped and not rounded as in Common Moorhen (Fig. 2). Overall coloration sooty-grey, darker on the lores, at the bill base and throat (Fig. 2); the wings and scapulars had an olive-brown cast, and upper-flank feathers white on the outer fringes, producing a white line on the flanks; undertail-coverts also white (Fig. 1). Legs yellow (present colour) with no reddish on the tibia. The bare parts of the specimens in this collection do not seem to have ever been painted, as was often common practice. All these characteristics are typical of Lesser Moorhen, and exclude both Black Crake and Common Moorhen (with both of which the author has ample experience). The following measurements (all within published values for the species) were taken with callipers (to 0.1 mm): bill length (upper tip of frontal shield to bill tip) 29.4 mm; head and bill 46.4 mm; wing 132 mm; primary projection 19.2 mm; middle toe (to tip of claw) 52.6 mm; middle toe (to base of claw) 44.1 mm; tarsus: 38.5 mm.

Several plumage traits, and tarsus length, suggest that the bird is a male. According to Urban *et al.* (1986) mean tarsus length of males is 36.6 mm (range 35–39, *n*=9) and that of females is 36.7 mm (range 36–37, *n*=3). This confirms the original sex determination, presumably made via gonad analysis. After a full renumbering of the seminary collection at the Museu do Jardim Botânico, the specimen is now accessioned under the number MADS-a114.

Black Crake should therefore be removed from the list of birds recorded in the Western Palearctic. Rather, the specimen represents the first Lesser Moorhen for the same region. This species has a similar range to that of Black Crake, occurring throughout most of sub-Saharan Africa (although it is somewhat uncommon and local) as far as northern Senegal (Urban *et al.* 1986).

There are three other published records of Lesser Moorhen for the Western Palearctic, but only one of them is widely accepted as valid (in Egypt, at Lake Nasser in May 1997; Haavisto & Strand 2000). The other two concern singles in southern Spain (origin unknown: Algeciras, Cadiz, 10 March 2003; de Juana *et al.* 2005), and on the Canary Islands (never submitted to a rarities committee: immature, Las Palmas, Gran Canaria, 19 January 1997; Clarke 2006). The date of the Madeira record accords well with the pattern observed for other African vagrants to Europe (Hudson 1974, Alström *et al.* 1991). A juvenile female was recorded off Brazil, on St. Peter and St. Paul Rocks, on 10 January 2005 (Bencke *et al.* 2005), demonstrating that *G. angulata* is even capable of transatlantic vagrancy. This species' movements are apparently triggered mainly by rainfall patterns and water levels at wetlands (Urban *et al.* 1986, Dodman & Diagana 2006).

Acknowledgements

The director of the Museu do Jardim Botânico do Funchal, Roberto Jardim, kindly permitted examination of the bird collection, and Luís Câmara offered logistical help at the museum. Francisco Fernandes drew my attention to this neglected collection and Paulo Catry lent me many of Schmitz's papers. I also thank the referees, Frank Zino and Pierre-André Crochet, and the editor, Guy Kirwan, for their important comments. I dedicate this note to Ernesto Schmitz for his efforts to increase our knowledge of the avifauna of Madeira.

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First record of Todd's Nightjar *Caprimulgus heterurus* in Guyana

by Christopher M. Milensky, Fiona A. Wilkinson & Ashley P. Holland

Received 22 September 2008

Todd's Nightjar *Caprimulgus heterurus* has recently been reinstated as a full species by the AOU's South American Checklist Committee (Remsen *et al*. 2008). The species was originally described by Todd (1915), but later grouped with its sister taxon, Little Nightjar *Caprimulgus parvulus*, without justification by Peters (1940) and since then its status has been debated (Davis 1978, Hardy 1983, Cleere 1998, Hilty 2003). Vocalisations of the two species distinctly differ (Fig. 1). In addition, *C. heterurus* breeds in the grassland / forest edge across northern Colombia and north-central Venezuela, whilst *C. parvulus* is unknown north of the Amazon River. Nightjars are easier to locate when they vocalise frequently, primarily in the breeding season, but nesting information and status at other times of year in general is lacking.

Here we present a new country record of *C. heterurus* from Guyana on 1 September 2006. This record is significant because it is the first for the expansive Gran Sabana / Roraima-Rupununi savanna region of northern South America. At 20.35 h at the village of Yupukari in the northern Rupununi savanna (03°39′36″N, 59°20′52″W), a single nightjar was seen and sound-recorded by APH using a Sony MZ-NF810 Minidisc and Sennheiser ME66 microphone. The recording is archived at the Macaulay Library of Natural Sounds, Cornell, Ithaca, NY (MLNS 138135). The bird was perched on a bush in savanna bordering dense gallery forest along the Rupununi River. What was presumably the same bird was heard singing at the same location on 2 and 4 September. Each time it sang intermittently for *c*.1 hour. This range extension demonstrates the need for further research, not only for this species but also for nightjars in general. More data will be necessary to determine if *C. heterurus* breeds in this savanna region of the Guianas or is merely an irregular visitor.

Acknowledgements

We would like to recognise Cindy Lawrence for initially hearing the bird and bringing it to our attention. Mark Robbins encouraged publication and offered suggestions on the manuscript. Assistance in archiving the recording at the Macaulay Library was provided by Jesse Barry and Greg Budney. Miguel Lentino, Steve Hilty and Brian O'Shea provided useful information while researching this record. This is number 142 in the Smithsonian's Biological Diversity of the Guiana Shield Program publication series.

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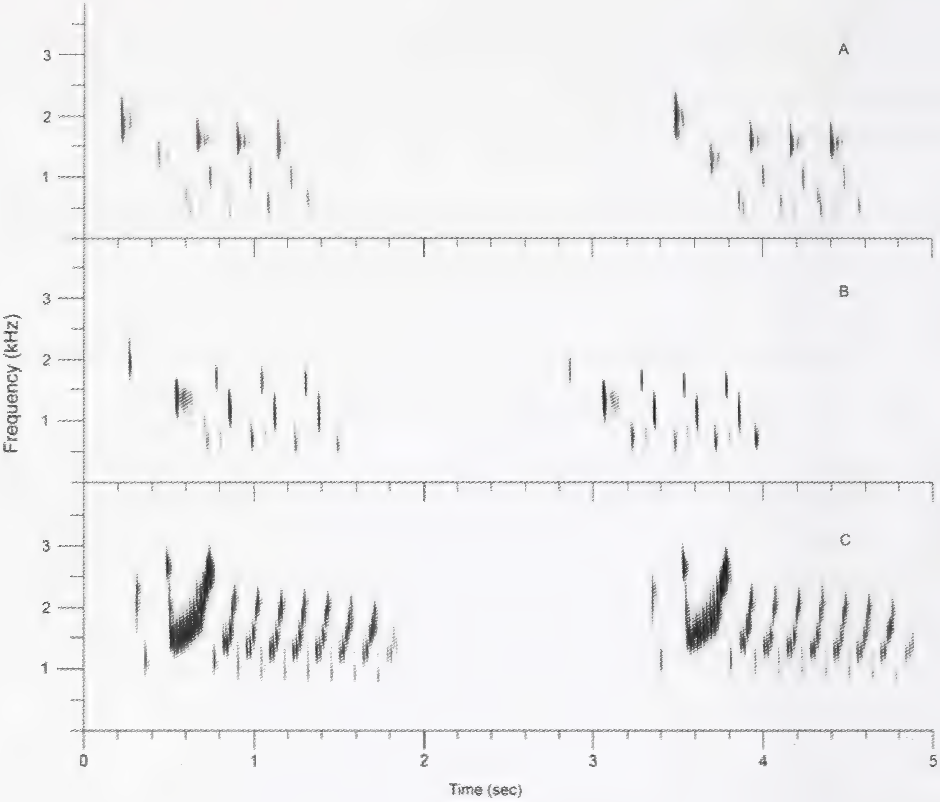

Figure 1. (A) Todd's Nightjar *Caprimulgus heterurus*, village of Yupukari, Rupununi savanna, Guyana, 1 September 2006 (MLNS 138135). (B) *C. heterurus*, near Petare, Venezuela, April 1961 (recorded by P. Schwartz, and published by Ranft & Cleere 1998). (C) Little Nightjar *C. parvulus*, Arcoverde, Pernambuco, Brazil, December 1973 (recorded by C. Chappuis, and published by Ranft & Cleere 1998). Sonograms created using Raven 1.2 (Cornell Lab of Ornithology, Bioacoustics Research Program).

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As far as possible, review, return of manuscripts for revision and subsequent stages of the publication process will be undertaken electronically. For instructions on style, see the inside rear cover of Bulletin 125 (1) or the BOC website

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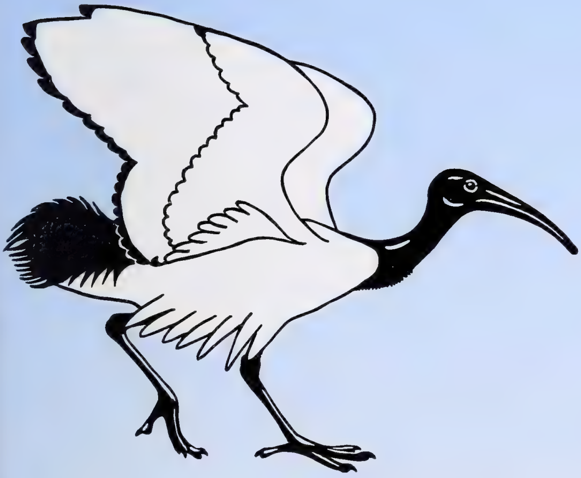

Volume 129 No.3
September 2009

MEETINGS are normally held in the **Sherfield Building** of **Imperial College**, South Kensington, London SW7. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

24 November—Jeffrey Boswall—*Answering the calls of nature: an ornithological frolic with serious scientific and cultural undertones*. Jeffrey Boswall claims to be a serious amateur ornithologist but was a professional wildlife broadcasting producer for the BBC. He says this is the "climax of his world tour, positively his farewell appearance".

Applications to Hon. Secretary (address below) by **10 November 2009**

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6 October—Prof. David Goode—*London's natural history in 50 years time*. Prof. David Goode was Director of the London Ecology Unit and later Head of Environment at the Greater London Authority. His talk will review the current position regarding nature conservation in London and will go on to make predictions for the next 50 years, concentrating particularly on the effects of climate change on birds.

Applications to Hon. Secretary (address below) by **22 September 2009**

Provisional dates for Tuesday evening meetings in 2010 have been selected as follows:

26 January, 9 March, 27 April (incl. AGM), 22 June, 21 September and 2 November

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876995 (or e-mail: boc.sec@bou.org.uk).

Contributors See the March issue of each volume for guidelines or the BOC website Bulletin pages, at www.boc-online.org/bulletin.htm

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Bulletin of the
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CLUB ANNOUNCEMENTS

Members are reminded that subscriptions for 2009 were due on 1 January and are kindly asked to check that any standing orders with their banks are recorded at the correct amount (£20 p.a.). Regrettably several members are still paying incorrect subscription rates, which cause the Club unnecessary time and expense in administration duties.

The 955th meeting of the Club was held after the AGM dinner on Wednesday 29 April 2009, in the Rector's Residence at 170 Queens Gate, Imperial College, London. Twenty-one members and 24 guests were present.

Members attending were: Cdr. M. B. CASEMENT, RN (*Chairman*), Miss H. BAKER, Ms K. COOK, Dr J. H. COOPER, D. J. FISHER, F. M. GAUNTLETT, Revd. T. W. GLADWIN, S. M. S. GREGORY, K. HERON JONES, G. P. JACKSON, M. C. JENNINGS, R. R. LANGLEY, Dr C. F. MANN, D. J. MONTIER, R. C. PRICE, Dr J. S. PRINGLE, Dr R. P. PRŶS-JONES, R. J. PRYTHERCH, P. J. SELLAR, S. A. H. STATHAM, and M. J. WALTON

Guests attending were: W. ACKWORTH, Mrs S. ACKWORTH, Miss T. CARD, Dr P. CASSEY, Mrs C. R. CASEMENT, W. R. J. CASEMENT, Mrs R. CASEMENT, Sir CLIVE ELLIOTT, Mrs M.H. GAUNTLETT, Mrs J. GLADWIN, Mrs A. C. HARDING, Mrs J. HERON JONES, The Viscount HOOD, The Viscountess HOOD, A. J. HOWARD, Mrs E. HOWARD, G. MAURER, C. J. MIDDLETON, Mrs R. MIDDLETON, Mrs M. MONTIER, B. O'BRIEN, D. G. D. RUSSELL (*Speaker*), Miss J. M. STATHAM and Ms S. WHEELER.

After dinner, Douglas Russell, a curator in the Bird Group (The Natural History Museum, Tring) gave a talk entitled *The Worst Journey in the World: an ornithological tale of bravery and endurance*. He prefaced his talk with the following quotation from Robert Falcon Scott's diary, at Cape Evans, 1911:—'To me, and to every one who has remained here the result of this effort is the appeal it makes to our imagination, as one of the most gallant stories in Polar History. That men should wander forth in the depth of a Polar night to face the most dismal cold and the fiercest gales in darkness is something new; that they should have persisted in this effort in spite of every adversity for five full weeks is heroic. It makes a tale for our generation which I hope may not be lost in the telling.'

As an allegory of suffering, the infamous 'Winter Journey' undertaken on the British Antarctic ('Terra Nova') Expedition of 1910 is a poignant reminder of the hardships endured by some to study ornithology. During the expedition, observations on birds were made by several members, but principally by the respected Chief of the Scientific Staff, Dr Edward A. Wilson. Over 100 ornithological specimens were taken during the expedition, including collections made in transit in the Southern Ocean. The most famous of all these specimens are undoubtedly the three Emperor Penguin *Aptenodytes forsteri* eggs collected in the depths of the Antarctic midwinter of 1911; a legendary journey when three men embarked on one of the most difficult and dangerous ornithological expeditions ever undertaken. Braving cold and misery that is difficult to imagine, they trod silently in darkness around Ross Island to retrieve three of the hardest won specimens in the Natural History Museum (NHM) bird collections. The story of the five weeks they spent battling against the winter weather, sheer bad luck and their own fears to bring back early embryos of the Emperor Penguin, required to test a then current theory in evolutionary biology, was superbly told by Apsley Cherry Garrard in his narrative of Scott's Last Expedition. Drawing on unpublished information from the archives of the NHM and elsewhere, the talk examined the motivations for the journey, its aftermath and the untold 20-year story of the research into the eggs by Dr Richard Assheton (1863–1915), Prof. James Cossar Ewart (1851–1933) and Dr Charles Wynford Parsons (1901–50).

Owls of the world

A. & C. Black Publishers regret that the recently deceased Jan-Hendrik Becking was omitted as co-author of the second edition of this work, published in November 2008. The authors of the revised edition are Claus König, Friedhelm Weick and Jan-Hendrik Becking.

A photographic record of Silvery Pigeon *Columba argentina* from the Mentawai Islands, Indonesia, with notes on identification, distribution and conservation

by Mark T. Lee, Yong Ding Li & Ong Tun Pin

Received 12 May 2009

Summary.—The Critically Endangered Silvery Pigeon *Columba argentina*, an insular pigeon of small islands off Sumatra and Borneo, has not been definitely recorded for over 70 years. We report here a photographic record of an individual observed near Masokut Island, off Siberut in the Mentawai archipelago, Sumatra, which documents the species' continued existence in the wild. We also present an overview of this pigeon's historical status in the region and a review of its key identification features. More research is needed to locate populations before any conservation measures can be designed.

Silvery Pigeon *Columba argentina* Bonaparte, 1855, is an enigmatic taxon of small islands and adjacent coastal forests in the Sunda Region with no recent confirmed records. It is one of the least-known birds in South-East Asia (Butchart *et al.* 2005, Yong 2009) with the only recent records being unconfirmed reports, on the Talang-Talang Islands and Banggi Island, two of Borneo's satellites (Rahman & Abdullah 2002, Wilson 2004), and from coastal and riverine forest on Sumatra (Nash & Nash 1985, van Marle & Voous 1988, Verheugt *et al.* 1993, Iqbal 2005). The last definite record involved a specimen taken in 1931 on Gurungan Besar Island, in the Karimata Islands, off south-west Borneo (Collar *et al.* 2001).

The specimen record suggests that Silvery Pigeon is (or was) a wide-ranging species, occurring on many small islands, with single mainland records on Sumatra and Kalimantan (Borneo). Its historical range included Simeulue Island, the Mentawai and Banyak islands off western Sumatra, the Riau-Lingga Islands off east Sumatra, the Natuna and Anambas islands, Burong Island off Sarawak and the Karimata Islands off south-west Kalimantan (Oberholser 1919, Chasen 1931, Robinson & Chasen 1936, Gibson-Hill 1952, van Marle & Voous 1988, Collar *et al.* 2001). Unconfirmed historical sightings are from Jarak Island in the Strait of Malacca (Robinson & Chasen 1936). A record from Sepilok (Sabah) on mainland Borneo is also considered unreliable (Sheldon *et al.* 2001). Since the last confirmed record in 1931, there have been reports at three reserves on the south-east coast of Sumatra (Padang Sugihan, Sembilang and Way Kambas), Banggi Island off northernmost Borneo and most recently, the Talang-Talang Islands off Sarawak (e.g. Nash & Nash 1985, Rahman & Abdullah 2002, Wilson 2004). None were confirmed due to potential confusion with the similar-looking Pied Imperial Pigeon *Ducula bicolor*, which is sympatric with Silvery Pigeon on small wooded islands, in coastal forests and mangroves (Collar *et al.* 2001).

Listed as Critically Endangered (BirdLife International 2004), Butchart *et al.* (2006) cited habitat loss and long absence of confirmed records as evidence for possible extinction. However a fairly recent, but undated photograph of two Silvery Pigeons of unknown origin held in a private collection, apparently in Hong Kong, provides evidence that the species is surely still extant. Here, we document a bird off Masokut Island, in the Mentawai Islands, which provides even more concrete evidence that the species survives in the wild.

Field observations

On 13 October 2008, at 16.49 h, MTL was on a boat between Masokut Island and Simaimu Island (at *c.*01°50′55.11″S, 99°18′08.45″E), two small islets off the southern tip of Siberut, in the Mentawai Islands, Indonesia. Masokut (1,400 ha) and Simaimu (120 ha) are within 10 km of Siberut and are separated by a 2.2 km-wide channel (Fig. 1). Both islands have substantial forest cover with fruiting trees noted at the time of the visit. MTL photographed a pigeon flying from Masokut towards Simaimu, in the opposite direction to that of small groups of pigeons, subsequently identified from photographs as Green Imperial Pigeon *Ducula aenea* and Pied Imperial Pigeon.

The lone pigeon appeared superficially similar to Pied Imperial Pigeon, which is common at the locality, and was thus initially dismissed as the latter. Subsequently, however, we noticed several features that differed considerably from Pied Imperial Pigeon. YDL compared the photographs with eight specimens of Silvery Pigeon, all collected pre-1950, and 20 specimens of *D. b. bicolor* from diverse localities, held at the Raffles Museum of Biodiversity Research, National University of Singapore (Yong 2009). We also traced two undated photographs of a captive pair of Silvery Pigeons of unknown provenance on an avicultural website (www.internationaldovesociety.com/SeedSpecies/SilveryWoodPigeon.htm), purportedly held in a private collection in Hong Kong.

Based on our comparisons with specimens, the photographs of the captive birds and illustrations of *C. argentina* and Pied Imperial Pigeon in the literature (Smythies 1981, MacKinnon & Phillipps 1993, Baptista *et al.* 1997), it is clear that MTL's images are the first of Silvery Pigeon in the wild. Whilst there were no past records from Siberut and her satellites, it is unsurprising that Silvery Pigeon should occur there given that it is apparently a highly nomadic, dispersive species. Indeed, Ripley (1944) predicted that Silvery Pigeon could occur on any of the West Sumatran islands.

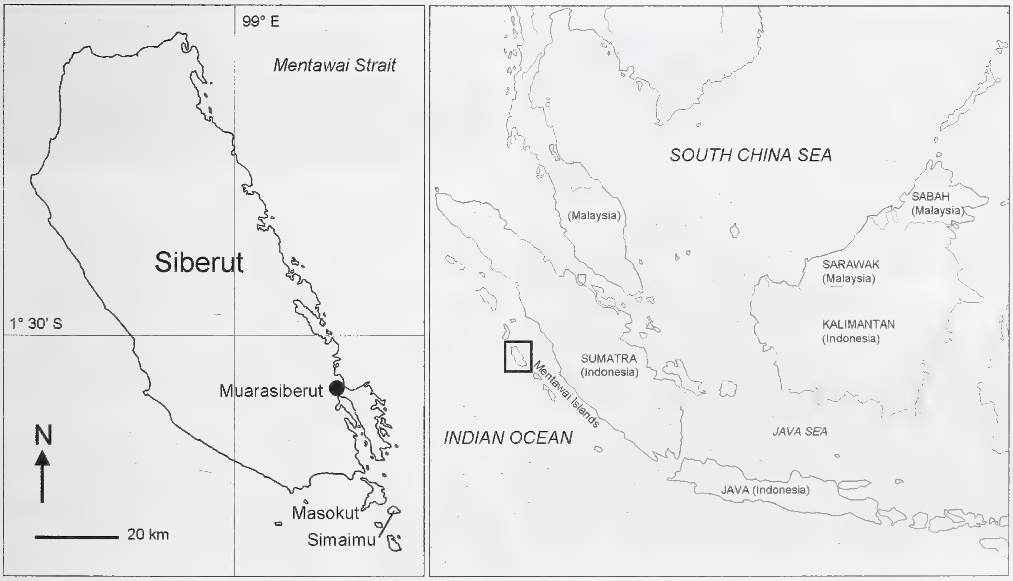
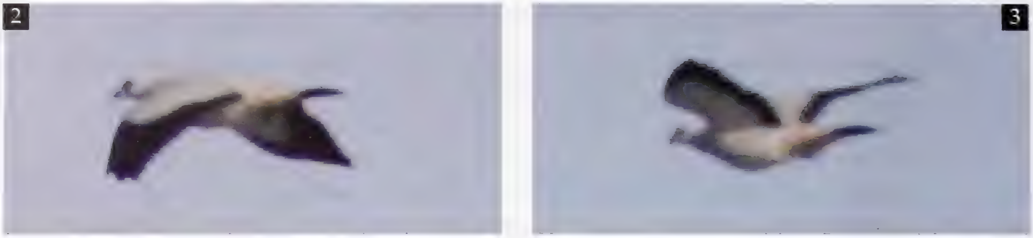
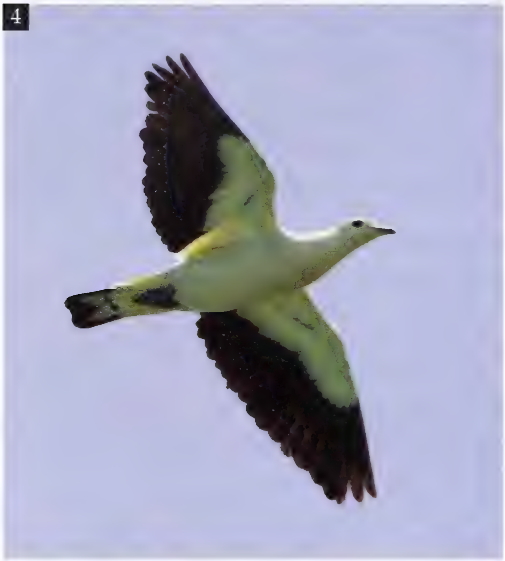
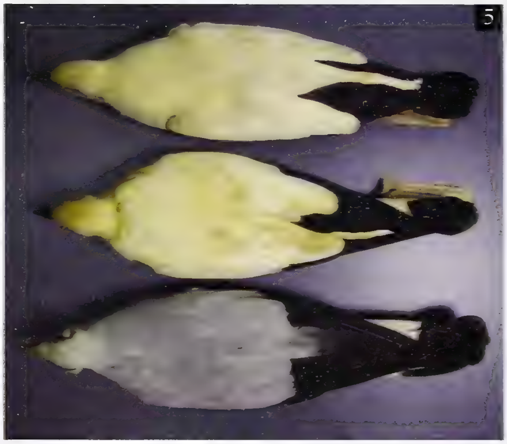


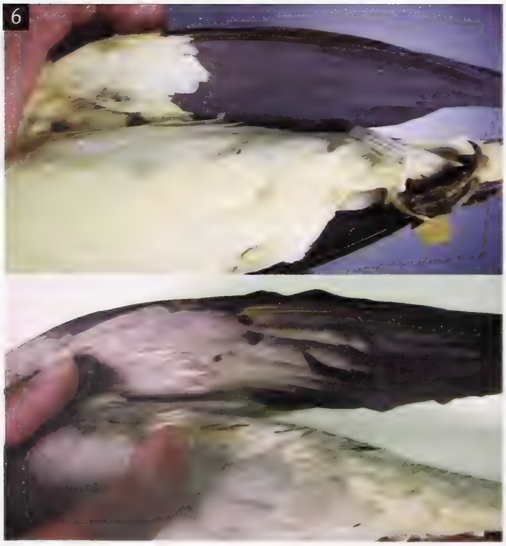
Figure 1. Location of Masokut and Simaimu in relation to Siberut (left), and the location of Siberut in the Mentawai Islands in relation to Sumatra (right)



Figures 2–3. Silvery Pigeon *Columba argentina* in flight showing upper- and underwing patterns, Masokut Island, Mentawai Islands, Indonesia, 13 October 2008 (Mark T. Lee)







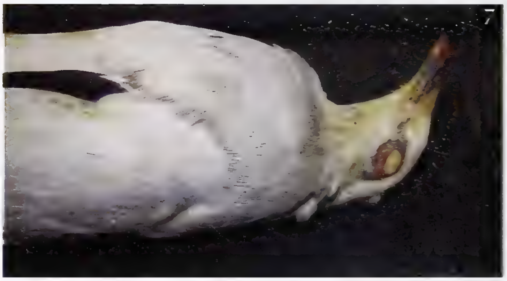


Figure 4. Pied Imperial Pigeon *Ducula b. bicolor* in flight showing underwing pattern, Similan Islands, Thailand, 11 March 2007 (Carl-Johan Svensson)

Figure 5. Two specimens of Pied Imperial Pigeon *Ducula b. bicolor* (top) compared with a Silvery Pigeon *Columba argentina* (bottom) (Yong Ding Li)

Figure 6. Underwing pattern of Pied Imperial Pigeon *Ducula b. bicolor* (top) and Silvery Pigeon *Columba argentina* (Yong Ding Li)

Figure 7. Specimen of Silvery Pigeon *Columba argentina* showing close-up of facial features, including the two-toned hooked bill and reddish orbital skin around the eye (Yong Ding Li)

Identification

Silvery Pigeon is easily confused with the very similar Pied Imperial Pigeon, with which it is sympatric (Gibbs *et al.* 2001, Butchart *et al.* 2005). Both are small-island specialists and historical observations from Burong Island, off Sarawak, and Bungaran Island in the Natuna Islands demonstrated that they nest and forage in close proximity (Robinson & Chasen 1936, Smythies 1981). However, based on the specimens mentioned above, we identified several consistent, diagnosable differences in plumage and bare-parts coloration. We concluded that despite the similarities highlighted in the literature, the two species are distinguishable using a few key features (Yong 2009).

Bare parts.—All specimens of Silvery Pigeon exhibited a distinct orbital skin that ranged from dark reddish to purplish brown, which is never shown by Pied Imperial Pigeon. Furthermore, this feature is consistent in the two captive birds. In flight at a distance, it is difficult to distinguish the eye within the darkish orbital skin, affording Silvery Pigeon the appearance of having an unusually 'large eye' (Fig. 2). In Silvery Pigeon the feathers of the forehead and lores extend over a large part of the maxilla, unlike Pied Imperial Pigeon. Silvery Pigeon has a two-toned maxilla with a deep purplish-red base (almost black in specimens) and an orange-yellow tip covering *c.*50% of the maxilla. The mandible is also two-toned and hooked, although the yellowish tip occupies <25% of its length; in contrast the bill of Pied Imperial Pigeon is uniformly blue-grey. These features, however, will be difficult to observe in the field, unless the bird is seen very close (*cf.* Gibbs *et al.* 2001).

Plumage.—Overall, Silvery Pigeon is pale silvery blue-grey compared to the creamy white to white of Pied Imperial Pigeon. Perched Pied Imperial Pigeons should show black on the wings extending to the 'shoulder'. Seen from above, the primaries, primary-coverts and outer secondaries are black, whilst Silvery Pigeon has all-black primaries and secondaries (Baptista *et al.* 1997), so that when perched, Silvery Pigeon should show more black on its wings because the folded secondaries are wholly black, whereas only the outer secondaries are black in *D. bicolor*. Furthermore, the tail of Silvery Pigeon has a broad black terminal half, clearly lacking the extensive white in the outer tail of Pied Imperial Pigeon, which shows as a wedge-shaped apical tail-band (Fig. 4) (Gibbs *et al.* 2001).

Seen in flight, Silvery Pigeon should show a considerably narrower band of 'black' covering less than half the wing area (Fig. 3) as compared to Pied Imperial Pigeon, which shows extensive black covering more than half the wing area. Seen at close range, the underwing pattern of Pied Imperial Pigeon differs significantly from Silvery Pigeon, in which only the outermost primaries are all black. The remaining primaries and secondaries are only partially black, with the black covering about one-third of the lower vane. The amount of black on the feather also decreases away from the outer primaries, unlike Pied Imperial Pigeon in which the primaries and secondaries are all black. This pattern explains the narrower band of black on Silvery Pigeon's underwing when seen in flight (Yong 2009). As shown in Figs. 4 and 6, Pied Imperial Pigeon has considerably more black on the underwing.

Discussion

Columba argentina is probably the most enigmatic pigeon in the Sunda Region. Due to its superficial similarity to Pied Imperial Pigeon, confusion between them is highly possible and the species has quite probably been overlooked during biological surveys, given the lack of good illustrations in field guides, especially of birds in flight. The only such works to illustrate Silvery Pigeon are MacKinnon & Phillipps (1993) and Smythies (1981), neither of which depicts the species in flight. Other illustrations, mostly showing perched birds, are in Gibbs *et al.* (2001), Wells (1999) and Baptista *et al.* (1997; also reproduced in Collar *et al.* 2001). The underwing pattern of Silvery Pigeon is frequently assumed to resemble that of Pied Imperial Pigeon (*cf.* Gibbs *et al.* 2001), although as demonstrated here this feature is actually one of the most useful to separate the two species.

Our images represent the first wild photographs of Silvery Pigeon, and provide confirmation that the species persists. The identification was based on four key features. (1) Whilst it might initially appear an artefact of blurring in the photograph (Fig. 2), the unusually 'large eye', in fact is due to the dark orbital skin, and as we have shown, occurs in both sexes. (2) The extent of black on the tail is well defined and occupies only the terminal half on the pigeon photographed, which is consistent with specimens and illustrations (e.g. Baptista *et al.* 1997, Wells 1999, Gibbs *et al.* 2001), whereas in flight *D. bicolor* exhibits more considerable white on the undertail. (3) The underwing pattern is perhaps the most conclusive feature in the identification. It has generally been assumed that Silvery Pigeon has an underwing pattern more or less similar to Pied Imperial Pigeon, and certainly the difference has never been highlighted in the literature (e.g. Smythies 1981, MacKinnon & Phillipps 1993, Baptista *et al.* 1997, Wells 1999, Gibbs *et al.* 2001). The Silvery Pigeon photographed had a narrow band of black on its secondaries and primaries, covering the entire feather only over the outermost 2–3 primaries. In specimens, we found that most of the inner primaries and secondaries are not completely black, unlike Pied Imperial Pigeon, with most of these feathers being black over only 30–50% of their length. (4) In our comparison of Silvery Pigeon and Pied Imperial Pigeon specimens, plumage colour differences should appear striking when birds are seen close, even in poor light. Silvery Pigeon has a largely blue-greyish appearance with a slight green iridescence on the nape (not visible at a distance) unlike the very pale cream-white plumage of Pied Imperial Pigeon (Fig. 5).

Our record of Silvery Pigeon is unsurprising given that the species has been recorded historically on other islands in the Mentawai group and is speculated to disperse widely in search of food (Collar *et al.* 2001).

Silvery Pigeon is considered Critically Endangered (BirdLife International 2004) and ecological data are limited, making field surveys an urgent priority as a prelude to conservation measures. Currently, priority should be afforded to follow-up surveys of Siberut and her satellites (especially Masokut) to locate remnant populations. This could be complemented by baseline surveys of fruiting tree phenology to better understand food availability and feeding ecology of pigeons on small islands. Such work is also especially needed in the Banyuasin Peninsula of south-east Sumatra, where there have been unconfirmed modern records of large numbers of this pigeon (Nash & Nash 1985). Furthermore, increased field work on small forested islands in the region, especially those where the species has not been previously recorded but that still possess suitable habitat (e.g. Nias, Singkep, Tioman) might detect new populations.

One major threat faced by Silvery Pigeon is habitat loss, with extensive clear-cutting for agriculture and logging occurring throughout the species' range. Batam Island, where Silvery Pigeon formerly occurred, is now largely deforested with very little remaining forest habitat (Sodhi *et al.* submitted). Neighbouring Bintan is comparatively less developed, but is now only 16% forested (Sodhi *et al.* submitted). Recent surveys have failed to detect the species on both islands (Rajathurai 1996). Likewise, Pagai Selatan, another island from which the species is known, is also now heavily deforested (Collar *et al.* 2001). Hunting probably also takes a toll, as with many pigeons in Asia, Australia and Oceania (Walker 2007). Whilst no direct evidence exists to indicate that Silvery Pigeon is hunted for food, large-bodied pigeons, especially many similar-sized *Ducula*, often provide subsistence meat (Sankaran 1998, Walker 2007). Further losses might occur through poaching to supply the pet trade, as exemplified by the two captive birds in Hong Kong. However, the true impact of hunting on wild populations remains unknown.

Acknowledgements

We thank Kelvin Lim from the Raffles Museum of Biodiversity Research, National University of Singapore, for granting access to specimens, as well as Albert Low, Alfred Chia, Christian Artuso, David Bakewell, Frank Lambert, Krys Kazmierczak, Lim Kim Chuah, Lim Kim Seng and Nick Brickle for their suggestions and various inputs during the preparation of this paper. Carl-Johan Svensson permitted use of his excellent photograph. Clive Mann, Colin Trainor, David Wells and Stuart Butchart provided many helpful comments on the submitted draft.

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First observations of Fiji Petrel *Pseudobulweria macgillivrayi* at sea: off Gau Island, Fiji, in May 2009

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SUMMARY.—The first unambiguous observations of Fiji Petrel *Pseudobulweria macgillivrayi* at sea are documented with photographs. The species' behaviour, jizz and flight are described, presented together with comments on confusion species, especially Bulwer's *Bulweria bulwerii* and Jouanin's Petrels *B. fallax*, and Christmas (Kiritimati) Shearwater *Puffinus nativitatis*. Preparations for the expedition, why a given sea area was chosen, the 'recipe' and use of 'chum' as an attractant, and the methods used for counting petrels are explained. The four specimens of Fiji Petrel were studied in detail and records of grounded birds, from the only known location, Gau Island, Fiji, were reviewed and their ageing re-considered. These data permit us to speculate on this petrel's breeding season, which is highly relevant to the future conservation of this Critically Endangered species.

We report the results of pelagic work off Gau Island in May 2009, during which our prime objective was to observe Fiji Petrel *Pseudobulweria macgillivrayi* in its marine environment. Until now the species has been identified only on Gau itself, where the type specimen was collected in 1855 (Gray 1859). Thereafter the species went unrecorded for nearly 130 years until one was caught in 1984 (Watling & Lewanavanua 1985). Considerable but unsuccessful efforts have been made to search for nesting sites on Gau, but several grounded birds have confirmed its continued presence (Priddel *et al.* 2008). Because Fiji Petrel is exceptionally rare and extremely poorly known (Bourne 1965, Imber 1986, Bretagnolle *et al.* 1998, Brooke 2004), being listed as Critically Endangered (IUCN 2009), any new data concerning range and abundance are vital to its conservation.

The Fiji Islands are in western Polynesia, *c.*2,000 km north of New Zealand and east of Australia. Volcanic Gau (18°01'S, 179°17'E; 136 km^2) is 57 km east of the main island of Viti Levu and is Fiji's fifth-largest island. Rugged and mountainous, Gau rises to 715 m, has *c.*50% forest cover, and supports a human population of 3,000 (Watling 1985, Priddel *et al.* 2008). The people of Fiji, especially Gau, are proud of their petrel, known locally as *Kacau ni Gau*; it featured on the former Fijian $50 banknote, and is the logo of Air Fiji. Because John MacGillivray was not involved with the holotype's collection (Watling & Lewanavanua 1985, Bourne 2007) we endorse Fiji Petrel as the species' English name.

Several organisations over the years have supported the National Trust of Fiji's efforts to conserve the species, which have chiefly involved awareness raising and training people to give 'first aid and release' to any grounded birds attracted to village lights (*cf.* Priddel *et al.* 2008). There has also been an emphasis on gaining data from dead and / or grounded birds to assess the timing of breeding (Priddel *et al.* 2003). The idea to search deep oceanic waters was originally proposed and instigated by HS, in 2005, with a second expedition by HS, TP, JK and DW in 2008 (Appendix 3). Our objectives were to gather data on identification and behaviour of this virtually unknown *Pseudobulweria*. The May 2009 expedition was one of several field surveys within a new conservation project planned by NatureFiji-MareqetiViti (NFMV 2009a) in partnership with the National Trust of Fiji. The main objective is to learn more about Fiji Petrel, and to find and protect its nests from the threat posed by rats, feral cats and an expanding population of feral pigs.

Methodology

Finding Fiji Petrel at sea was no accident; the sea area surveyed and the methods used were planned following surveys in 2005 and 2008. We used a method of attracting petrels close to the boat that HS and TP had developed and used successfully elsewhere in the world.

Timing.—The expedition dates were 13–22 May 2009. Prior to this, we examined the four specimens of Fiji Petrel collected on Gau (Appendix 1), reviewed the work of Priddel *et al.* (2008) and chose the period at sea based on two grounded birds. In early May 2005 two crashed onto village roofs, one of which was caught, and in April 2007 an adult female was caught. We concur with Bourne (1981) and Priddel *et al.* (2008) that the breeding season is likely to be sometime from April, and that in May breeders might be supplemented by the presence of non-breeders. May was chosen as the month when most birds might be encountered at sea, close to the island. May marks the transition between the cyclone season and the onset of the south-east trade winds, so major storms would be unlikely. We also took into account the lunar cycle, knowing that we would commence the work when the moon was near full, at which time fewer birds were likely to be in the vicinity. However, over ten days at sea we should learn if there were changes to numbers (and species) relating to the lunar cycle. Many petrels, being nocturnal at their colonies, tend to return in darkness to avoid predators, but local conditions, like cloud cover and stage of breeding, also determine arrival. The rather full moon at the outset might show that petrels use the period of darkness before the moon rises to reach nearby waters earlier in the day.

'Chumming'.—The objectives were to determine the following. (1) Whether Fiji Petrels can be observed at sea and to provide information on their identification and behaviour. (2) If photography can enable adults and juveniles to be distinguished, thereby contributing to an assessment of the timing of breeding. (3) Whether Fiji Petrels can be attracted, in sufficient numbers, close to a small boat to enable capture for transmitter attachment. We plan three trips before the technique is reviewed. Frozen 10-kg blocks of 'chum' were used. Each block comprised 60% fish offal (6 kg), cut into small pieces and mixed with 10% very dense fish oil (one litre) to which 30% water (three litres) was added. In addition, we used large-fish livers cut and mixed with fish oil and popcorn. In total, we transported 1,000 kg of 'chum' and 100 kg of the liver mix to the island in freezers. The 'chum' was prepared a few weeks ahead by volunteers from NatureFiji-MareqetiViti. The 'chum recipe', quantity needed and its use was piloted off Gau in 2008, based on previous work (Shirihai 2008a) where it was found that dissolving frozen blocks act as the principal attractant, whilst the liver pieces, which float naturally, are added, as required, to maintain the petrels' interest. Frozen 'chum' blocks persist for up to 1.5 hours creating a pungent and constant oil slick, with the aroma and visible slick being pushed downwind, attracting petrels from some miles away. One or two blocks, plus a small amount of liver, were dropped overboard at intervals of 1.0–1.5 / hour. We 'chummed' for *c.*50 hours during the ten days with daily sessions lasting a mean of five hours.

Study area.—Given the location of Gau in relation to neighbouring islands, its bathymetric setting based on ocean charts, and the prevailing winds, we concentrated effort in the ocean due south of the island. We surveyed an area, *c.*25 nautical miles (nm) from Gau, mainly at 18°27.293'S, 179°10.775'E (see also Results). This area was selected based on successful pelagic work with Zino's Petrel *Pterodroma madeira* off Madeira, Atlantic Ocean

(Shirihai 2008b, 2009), given similarities between the islands' topography, the approach of birds using the dominant winds, and the location of records of grounded birds in relation to the breeding sites. With Kadavu to the south-west, Viti Levu to the west, an arc of islands—Ovalau, Batiki, Wakaya to the north and Moala and Matuku to the east—a direct passage from the open ocean converged on Gau. In 2005 and 2008 we found an afternoon / evening passage of petrels arriving from the south-west, bypassing Gau to the south, which we hoped to attract to the 'chum' as 'trigger species', so that any feeding frenzy might attract Fiji Petrels. May marks the beginning of the south-east trade winds, which would aid petrels returning to the island from the south and south-west, whilst most records of grounded Fiji Petrels are from the south-west of the island. The study area chosen is shown in Fig. 1.

Vessel.—We were based at Nukuloa village on Gau and travelled daily to the survey area in an open, sports-fishing speedboat, the privately chartered *HiFlyer* (12 m, two 225-hp outboard engines). Averaging 22 knots, we covered over 550 nm during the ten days, returning to Gau prior to dark to safely enter the narrow Nagali passage.

Camera equipment and GPS.—We used the most advanced camera equipment currently available, including Canon Mark3 D and DS, and 300-mm / F2.8 and 500-mm / F4 lenses,

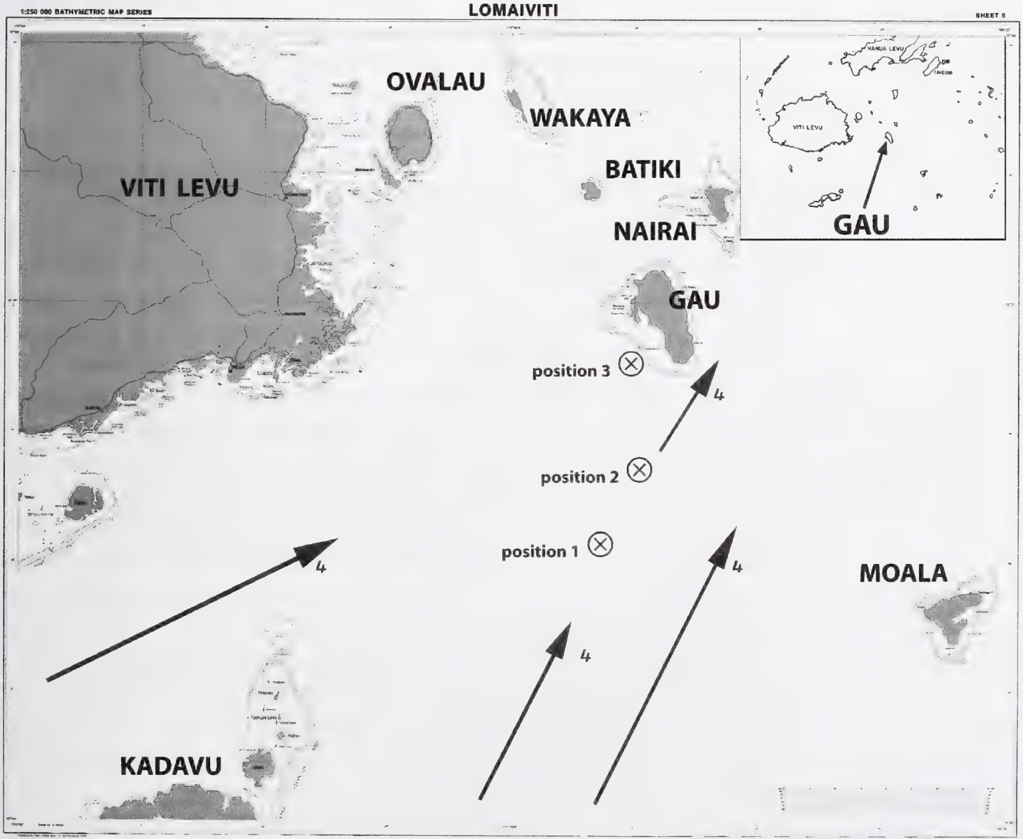

Figure. 1. Map showing Gau and locations of Fiji Petrels *Pseudobulweria macgillivrayi*. Position 1 (*c*.25 nm off Gau), Fiji Petrels 2, 3 and 6 recorded. Position 2 (*c*.15.0–17.5 nm off Gau), Fiji Petrels 1 and 5 recorded. Position 3 (*c*.4–10 nm off Gau), Fiji Petrels 4, 7 and 8 recorded. 4. Arrows show the direction of afternoon passage of Tahiti *P. rostrata* and Collared Petrels *Pterodroma brevipes* though this varied with wind, weather and cloud cover. See text for rationale for choosing the survey area.

as well as Nikon D 700, 300 mm / F4.0 and 1.7 converter. We used a mobile GPS, Garmin Colorado 300 with a marine chart programme, to waymark positions, travel between locations, and log sightings.

Data collection.—Usually the boat drifted just off the 'chum slick', permitting birds to move freely along the 'slick' and to feed undisturbed, as well as affording us the best angle for observing birds already attracted and those incoming. We counted birds and their activity during sessions of 30–60 minutes each. For each species we recorded the estimated number of birds during the session and the maximum number seen at one time. For consistency the same observer made virtually all counts. These counts are relevant to the commoner species, especially Tahiti Petrel *Pseudobulweria rostrata* and Collared Petrel *Pterodroma brevipes*, and, most importantly, can be directly compared to the numbers of Fiji Petrel in any period. Also, ten birds with distinct plumage due to moult and / or missing remiges were selected, and their visits to, and duration at, the 'chum' noted, which proved useful to determine overall numbers. At the end of each day we agreed on conservative totals. This method is the same as that recently used in Cape Verde and Madeira, where counts during 'chumming' were suggested as a tool to monitor the *Pterodroma feae* complex (Bretagnolle *et al*. in prep. a). Here, only our basic data are presented (Appendix 3, Table 2); additional data will be used in further research, currently being planned, and a future publication on the region's petrels.

Each Fiji Petrel seen was afforded a number with individual description, behavioural notes and photographs used in the analyses below. Prior to the work, we agreed the manner for accepting any sightings of the species; given various levels of relevant field skills, only when four of us (HS, TP, JK, DW) had observed a bird sufficiently for all key features to be detected, and were unanimously agreed, was an identification considered certain. We photographed four of the eight Fiji Petrels we saw. All other petrels seen during the expedition, and in 2005 and 2008, are recorded in Appendix 3; for those observed in 2009 see Table 2. Also we studied plumages of the polymorphic Collared Petrel (Watling 1986a), particularly variation within darker morphs (>200 birds were photographed).

Results

Fiji Petrel sightings.—This section records sightings of Fiji Petrels and other tubenoses (see Appendix 3 and Table 2 for all species and estimated numbers). ***13 May***—Fiji Petrel 1 seen at 10.50 h, at 18°18.722'S, 179°13.515'E (*c*.15 nm off Gau), flying in quite high arcs west; Fiji Petrels 2–3 visiting 'chum' at 18°27.293'S, 179°10.775'E (*c*.25 nm south of Gau), for timings see below, both photographed; during each appearance, per session, there were also *c*.20 (max. 11 at once) Tahiti Petrels, *c*.20 (13) Collared Petrels, two Gould's Petrels *Pterodroma leucoptera*, one Mottled Petrel *P. inexpectata* and a Wedge-tailed Shearwater *Puffinus pacificus*. ***14 May***—Fiji Petrel 4 at 17.29 h, at 18°12.020'S, 179°13.552'E (*c*.10 nm off Gau), appeared to be heading towards Gau. ***16 May***—Fiji Petrel 5 at 12.15–12.25 h, visiting 'chum' at 18°21.968'S, 179°14.855'E (*c*.17.5 nm south of Gau), photographed; also observed were *c*.5 (max. 3) Tahiti Petrels and a Collared Petrel. ***17 May***—Fiji Petrel 6, at 11.25–11.35 h, visiting 'chum' at 18°27.293'S, 179°10.775'E (*c*.25 nm south of Gau), photographed, and its behaviour described below; also observed were *c*.20 (max. 8) Tahiti and *c*.20 (5) Collared Petrels, and single Sooty *Puffinus griseus* and Wedge-tailed Shearwaters. En route to Gau, at 17.45 h, Fiji Petrel 7, at 18°06.900'S, 179°15.424'E (*c*.2 nm outside the reef and *c*.4 nm from Gau), clearly seemed to be on approach, flying north to north-west, and perhaps adopting a 'holding' position, awaiting darkness before flying to the island. We spent time inside Gau lagoon, off the village of Nawaikama, facing a valley and the island's highest peak, to check if this or any other bird arrived at dusk, but none was seen. ***18 May***—Fiji Petrel 8, at 17.30 h, at 18°09.523′S, 179°13.909′E (just 3.6 nm from the reef and *c*.5 nm from Gau), was flying north-east, and again appeared to be adopting a 'holding' position, waiting for darkness.

It is premature to conclude much from these observations, but we noted two main activities. (1) Towards dusk, post-17.30 h, Fiji Petrels 4, 7 and 8 were closer to land, off the south-west of the island, presumably before flying in under complete darkness. All four birds photographed were adult-like (see Ageing and moult), i.e. presumably breeders. (2) During the day, some (Fiji Petrels 2, 5 and 6) were south off the island (mostly *c*.20 nm and more), and were attracted to the 'chum'. There is a possible correlation between the number of Fiji Petrels and numbers of commoner petrels visiting the 'chum'.

Behaviour at sea and response to the boat.—Fiji Petrel is rare and our encounters too few to permit a detailed description of its behaviour at sea. However, we can state that the species appears to ignore boats: of the eight sightings, four were en route to, or in the vicinity of, Gau and these birds showed no interest in the boat, as sometimes happened with Tahiti Petrels. At the 'chum', where the other four individuals were seen, Fiji Petrel seemed to tolerate our small boat, with bird 2 approaching food on the surface just a few metres away several times and once flying over the bow. The duration of uninterrupted visits by the four birds attracted to the 'chum' was 2–10 minutes (mean *c*.7.3 minutes of six visits). Bird 2 revisited twice, as verified by photographs: the first visit at 14.21–14.28 h (*c*.8 minutes) was followed by a gap of seven minutes, reappearing at 14.35–14.40 h (*c*.6 minutes), before another gap of *c*.13 minutes then returning at 14.53–15.01 h (*c*.8 minutes). It was in the vicinity for *c*.44 minutes. The two other Fiji Petrels visited the 'chum' once only. Bird 3 was seen for two minutes, arriving at 17.24 h as dusk approached and we were preparing to depart; it might have stayed after our departure. Our impression was that this bird's rather brief, hesitant approach was determined by the larger Tahiti Petrels, who could be aggressive at the 'chum', calling loudly when squabbling. Fiji Petrel may be subordinate in such a melee. Bird 6 was observed to take some offal, only to then be chased by a Tahiti Petrel and, after landing again, drop the food and depart. The foraging technique of Fiji Petrels at 'chum' is similar to *Pseudobulweria rostrata* and *P. becki* that HS and TP have observed in the Pacific. Fiji Petrels usually approached from downwind and slowly zigzagged over the 'slick', suddenly changing direction to drop onto a small floating morsel (14 such approaches were observed by four birds). Also, bird 6 landed briefly on the water with wings held upwards and partially opened, in a manner used by *P. rostrata* and *P. becki*. Fiji Petrel, like gadfly petrels, appeared to be attracted to the 'chum' using both smell and sight. The bird that stayed on the 'chum' longest (bird 2) was observed on the day that we recorded the largest numbers of other petrels.

Ecology and conservation

When does Fiji Petrel breed? The protection of this Critically Endangered species is the main objective of all our activities. To enable this, an understanding of the breeding cycle is essential in order that resources can be targeted to the period when active nests are most likely to be found and protected. Any data on moult and / or age of photographed birds can contribute to this (see Ageing and moult; Appendix 1). Priddel *et al*. (2003, 2008) relied primarily on the presumed age of the holotype as the key to the breeding period, however, we can no longer be sure of this bird's age and have therefore excluded it from our calculations.

Fig. 2 shows records of grounded petrels that Priddel *et al*. (2008) considered confirmed, with the addition of the 2009 bird. It shows also the six we examined (as specimens or in

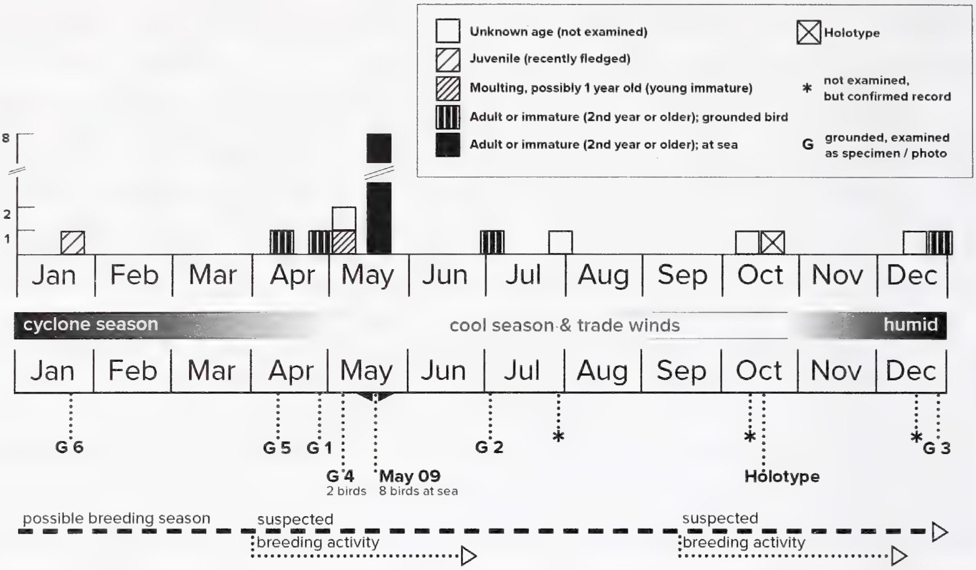

Figure. 2. Records of Fiji Petrels *Pseudobulweria macgillivrayi* from Gau Island, Fiji, and nearby seas 1855–2009. For details of grounded birds see Appendix 1 (G = grounded Fiji Petrels 1–6). The eight birds seen at sea in May 2009 are also shown. Centre, the winter cool season with trade winds, and the hot and humid cyclone season are illustrated. Below, months when breeding activity is suspected based on ages of grounded birds (see legend) and our observation of birds close to shore.

photographs), and for which ages can be ascertained using moult. Of ten Fiji Petrels (six grounded 1984–2009 and four photographed at sea) nine were adults or immatures (second-year or older) and only one a juvenile (January 2009). Grounded records are mostly in April–July, with fewer in October–January, and none in August–September or February–March. With so few records, it is premature to conclude that the breeding season of Fiji Petrel falls during a given climatic cycle (Fig. 2), although the majority of records are from the cool season during the trade winds.

Priddel *et al.* (2008), following Bourne (1981) and Imber (1986), assumed Fiji Petrel to be essentially an austral winter breeder and, with the holotype collected in early October believed to be a recently fledged juvenile, eggs would be laid sometime in June (based on 118 days estimated from laying of the egg to fledging for similar-sized petrels). Our data, however, tend to suggest a protracted breeding season, perhaps lasting most of the year. The records are not spread evenly through the year but dates, moult and behaviour suggest two periods of apparent breeding activity. *April–July*: three of the six documented grounded birds, adults (or non-breeding immatures), were from this period, including that on 4 May, which was the only bird in active moult showing, apparently, juvenile-retained remiges, suggesting a moulting youngster. Since non-breeding immatures may arrive at the island a few weeks after breeding adults, we speculate that adults might arrive during April, with breeding probably commencing in May (or even mid April) including a pre-laying exodus. The breeding season of petrels of this size may extend *c*.5 months (with pre- and post-breeding activities) yet to date there are no confirmed records for August. *October–January*: the discovery of a very fresh, recently fledged juvenile on 19 January 2009 suggests that breeding also commences from October (or even September). However, there are too few records to conclude that the breeding season is continuous, or contains two peaks, or even to identify when the bulk of breeders probably come ashore. For now, we suggest searching for nests from late April and May and that these months might be more profitable for spotlighting, capturing birds for telemetry, and for the proposed use of trained dogs for locating breeding sites (Priddel *et al.* 2008).

How rare is the Fiji Petrel? We observed only a few Fiji Petrels. This was despite choosing what we considered to be the optimum month, and a period when the moon went from almost full to almost new. We worked a corridor, from positions far offshore to close inshore, from where petrels approached Gau. We used large amounts of 'chum', targeting all petrels, and we believe few birds in the vicinity would not have been attracted at some time. The present evidence is that few Fiji Petrels survive, that immediate efforts to find the nest sites are needed, and prompt, effective protection is urgently required before it is too late. Recent work with *Pterodroma madeira* off Madeira (Shirihai 2009) recorded 13 birds at sea in eight days, where a comparatively well-known population is estimated at *c.*80 pairs (Zino *et al.* 2008). Contrast this with our figures for Fiji Petrel and the population might therefore be <50 pairs. We endorse Brooke (2004) who wrote 'The species' population is unknown; it may be only a few tens of individuals'.

Two new threats to the species' survival are manifest. The first is the reports from islanders of a burgeoning population of feral pigs that are now ranging into summit forests—in the 1980s there were no feral pigs on Gau (Watling 1986b). Secondly, we observed several Tahiti Petrels, and a Kermadec Petrel *Pterodroma neglecta*, with damaged wings (partially broken and twisted inner primaries) suggesting that these birds had become entangled with long-lines when scavenging at fishing vessels. As Fiji Petrels are attracted to 'chum', they might well be exposed to the dangers of long-lining.

Description

Until now, the plumage of Fiji Petrel had been described only from specimens, and its characteristics and behaviour only assumed. Here we provide a full description of Fiji Petrel based on the eight birds we saw, which observations confirm that structurally and behaviourally it is a typical *Pseudobulweria*, and given good or prolonged views should be readily identifiable at sea.

Size and proportions.—A typical *Pseudobulweria* with large bill, proportionately long wings, and elongated rear body and tail. Total length *c.*29 cm and wingspan 73 cm (based on the recently grounded bird, January 2009). Full measurements are given in Table 1; see also Figs. 3–8. We observed Fiji Petrels directly alongside *P. rostrata*, the sole *Pseudobulweria* known to overlap in range, and our impression was that *macgillivrayi* is structurally a miniature version of *rostrata*. This is confirmed by actual measurements of body length, wingspan, wing and tail, which compared to data from *rostrata* (Villard *et al.* 2006) reveal Fiji Petrel to be *c.*27% smaller but with body mass 50% that of *rostrata*, adding to the field impression of a smaller delicate bird. It has several features that differ structurally though; the rear body, beyond the trailing edge of the wing, is very elongated, slim and tapers to the pointed tail, the tip of which is blunt and rounded (Figs. 3–5). The wings appear proportionately narrower and more pointed than Tahiti with the 'hand' (primaries) tapering markedly and sometimes appearing disproportionately longer than the 'arm' (secondaries) by *c.*35% (Figs. 3–6, 8). The bill is typical of the genus, being noticeably smaller than that of Tahiti (*c.*25% shorter), but appears more compressed forward of the nostrils at the culmen and the maxillary nail more bulbous (Figs. 3, 5–7). In profile the head looks rather square, with a 70°-slope to the forehead and flattish crown (Figs. 6–7). Its long narrow neck (e.g. Figs. 6–8) further enhances the slim, elongated impression of Fiji Petrel. Overall it never has the heavy-bodied appearance of Tahiti Petrel. On several occasions the feet of Fiji Petrel were

TABLE 1

Biometrics of the four specimens of Fiji Petrel *Pseudobulweria macgillivrayi*. All measurements by HS. Body mass data taken from the capture protocol. For wing formula see below.

	Wing		Tail	Tail graduated	Tarsus	Bill to feathers	Bill depth at feathers	Bill depth at top of hook	Bill depth at hook base	Total length	Weight (g)
	Right	Left									
Bird 1 ♂	205.5		83.7	23.9	36.0	25.8	12.0	8.5	8.5	280.0	
Bird 2 ♀	216.0	218.0	91.0	24.0	36.0	27.4	12.6	10.2	10.2	285.0	120
Bird 3	215.0					25.0		9.5			
Bird 4	225.0	225.5	90.0	29.0	37.8	27.4	12.2	10.3	10.3	288.0	145
Range	205.5–225.5		83.7–91.0	23.9–29.0	36.0–37.8	25.0–27.4	12.0–12.6	8.5–12.3	8.5–10.3	280.0–288.0	120–145
Mean	217.5		88.2	25.6	36.6	26.4	12.3	9.6	9.6	284.3	132.5

Bird 1 Holotype, Natural History Museum (Tring), October 1855; examined June 2008.
Wing formula: p10 (outer) 3.1 mm < tip (=p9 longest) [p10 = p8/9, closer to p8]

Bird 2 In possession of DW, collected 12 April 2007; examined July 2008.
Wing formula: primary tips heavily worn due to captivity and difficult to measure: p10 (outer) longest by 1.0 mm > p9 [or = p9]

Bird 3 Suva Museum (F605), collected 3 July 1985; examined July 2008 (wet specimen and difficult to obtain precise measurements).
Wing formula: p10 (outer) longest by 2.0 mm > p9

Bird 4 In possession of DW, collected January 2009; examined May 2009.
Wing formula: p10 (outer) longest by 3.5 mm > p9

seen. They do not project past the tail, ending far from the tip, and appear heavy and powerful (Fig. 3). The long tapering undertail-coverts reach the tail tip. In Fiji's seas, the species with the closest total length and wingspan to Fiji Petrel is Black Noddy *Anous minutus* (total length *c*.34 cm, wingspan *c*.76 cm), which is very frequently seen. No other petrels are directly comparable in size to Fiji Petrel, with perhaps only Collared (very frequent) and Black-winged Petrels *Pterodroma nigripennis* (rare) having a similar total length (*c*.29 cm), but their wingspans, at max. *c*.70 cm, are much shorter. These *Pterodroma* also possess a relatively shorter rear body and tail, and thus different overall shape. Amongst familiar tubenoses of the Pacific, Fluttering Shearwater *Puffinus gavia* has the nearest total wingspan (76 cm). Fiji Petrel, to some degree, is closer in size and structure to Beck's Petrel *Pseudobulweria becki* (HS and TP pers. obs. in Bismarck archipelago, Papua New Guinea) due to the relatively smaller size, more delicate structure, longer neck and narrower wings of *becki* in relation to *rostrata*. It too shares the squarer head and bulbous compressed bill, but *becki* lacks the distinctive tapering rear of Fiji Petrel.

Jizz and flight.—Fiji Petrel has several flight modes like those of *rostrata* and behaves similarly. However, being noticeably smaller and slimmer it is visibly more elegant. It flies effortlessly on characteristically long, narrow, pointed wings. When gliding (Figs. 3–5) into the wind, the wings are held rather stiffly and seemingly straight. Seen head-on, or from the rear, they are held slightly below body level, which forms a shallow arc in shape. The wingbeats are very relaxed and supple, appearing sometimes loose and languid. Even in ten-knot winds there were only a few shallow flaps. To our eyes, Fiji Petrel is not a particularly fast or energetic flyer. Only when the species was 'excited', near 'chum', was there clearly a more rapid pace with shorter wingbeats, swooping glides and more erratic changes of direction. Nevertheless, like gadfly petrels, arcing and banking (Fig. 3) can be impressive. We never observed any in really strong winds or rough seas, but one bird performed rather high arcing (up to *c*.15 m above the surface), like a *Pterodroma*, in direct flight (bird 1). In comparison, the larger and heavier Tahiti Petrel's flight involves much longer and higher glides and arcs. We never observed Fiji Petrel in calm conditions. With its slim dark body and long wings outstretched, a Fiji Petrel at distance shows a unique silhouette (Figs. 3 and 8), yet when investigating the 'chum' the long neck and rear body were more obvious (Figs. 5 and 7), illustrating the variation in posture. The spread wings in lateral profile can appear rounder, but this is due to foreshortening.

Plumage.—Fiji Petrel is uniformly dark brown (Figs. 3–4, 6 and 8). However, in certain lights and at various angles, some subtle shades and coloration patterns were perceptible. We also noted some slight variation between individuals. The head and body appear blackish brown in overcast conditions or when distant, but medium to richer and brighter brown in sunlight and close views (Fig. 7). The head and breast usually appear a shade darker than the rest of the body, but this is not always visible, and does not create any contrast. A small ill-defined dark loral mark is usually apparent (Fig. 7). The underparts, below the breast, often possess a very slight rusty hue, whilst some of the paler feather bases can be exposed, forming diffuse and asymmetric barring (Figs. 5 and 7). Both the degree of rusty shades and barring can be subtle and vary individually. The vent to undertail-coverts often appears slightly darker than the belly. The upperparts and upperwing lack any distinct pattern and are generally concolorous (Figs. 4 and 6). In certain lights the back and scapulars, and especially the lesser coverts, secondaries and five outermost primaries, are darker brown, with the bulk of the remaining coverts a slightly paler and richer brown. There is no pale carpal bar, or dark 'M' across the open wings, which several dark gadfly petrels possess. The underwing is somewhat plain brown, mirroring to a degree the upperwing with slightly darker / blacker lesser coverts, axillaries, secondaries and five outermost primaries (Figs. 3 and 5). The concealed bases and part of the webs of the greater coverts and the two largest rows of median coverts are diffusely greyer. When the wing is fully stretched or the coverts disturbed, for example by the wind, the bases are more visible and in some lights can show as pale areas, even as a ragged mid-wing band (Figs. 5 and 7). This effect, of a pale underwing panel, is illusory but can be brighter (and more apparent) when there is strong light reflection off the water or in captured birds, when the underwing-coverts are disturbed and camera flash heightens the falsity. Adults may show this pale band more extensively, though this might be due to individual variation and the number of feather bases and webs visible at the time. *Contra* Onley & Scofield (2007) we have not seen any birds in the field, or hand, showing a 'silvery sheen to flight feathers and outer wing-coverts' nor any 'pale lustre to the underwing' though this 'silvering' appearance can be common on many gadfly petrels, especially those in fresh plumage seen in bright light. The tail is concolorous with the uppertail-coverts and rump, or perhaps subtly darker, and shows no pattern.

Bare parts.—Based on our observations and photographs both at sea and in the hand, the bill and irides are blackish and the tarsi mostly pinkish flesh with a variable pale bluish tinge (= bluish-pink). Dorsally, the feet are mostly dark brownish black, from the outer side of the tarsus near the foot and over the whole outer toe. On the middle toe, the black coloration covers *c*.50% but on the inner toe just the tip. The base of the webs is pink, and the colour of the inner toe and basal half of the middle toe a purer blue, which coloration is clearly visible in images of birds with the folded feet exposed (Fig. 3).

Ageing and moult.—Examination of the moult of six grounded Fiji Petrels (1984–2009: see Appendix 1), and the four birds photographed at sea suggest the following. *Juvenile*—Of the ten birds, only 'grounded bird 6' can be certainly aged as a recently fledged juvenile. Like other petrels, at this stage the plumage is fresh and evenly feathered with no signs of

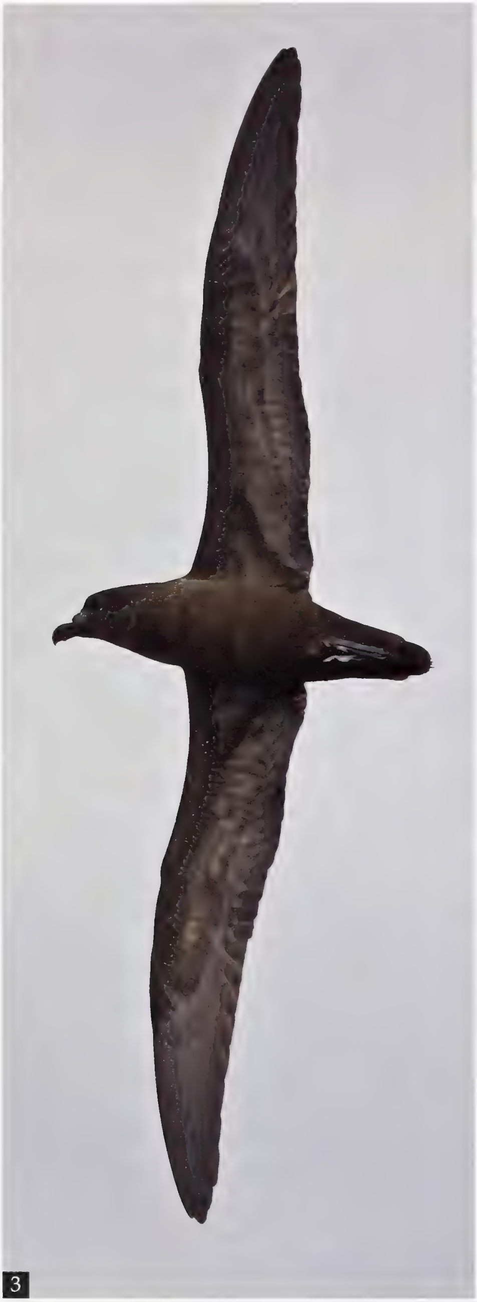

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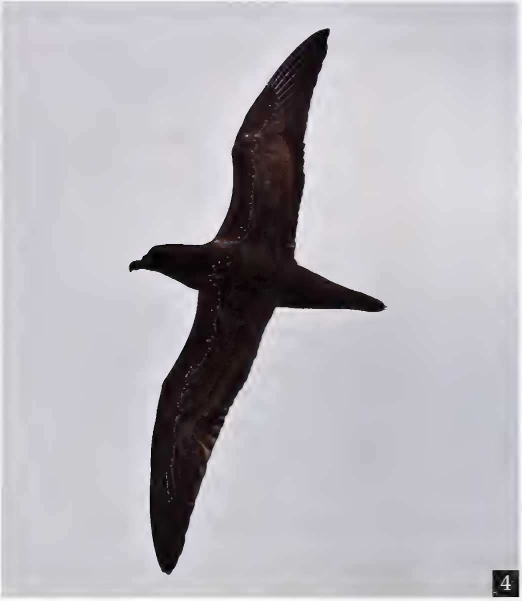
Figure 3. Fiji Petrel *Pseudobulweria macgillivrayi*, off Gau, Fiji, 13 May 2009. Bird 2 showing ventral side while arcing. Note typical *Pseudobulweria* structure; relatively large bill, proportionately long wings and slim elongated rear end. In natural light the entire underparts, fore and inner underwing-coverts and axillaries are dark brown whilst the remiges are fractionally paler / greyer, with no apparent pattern below (Hadoram Shirihai)



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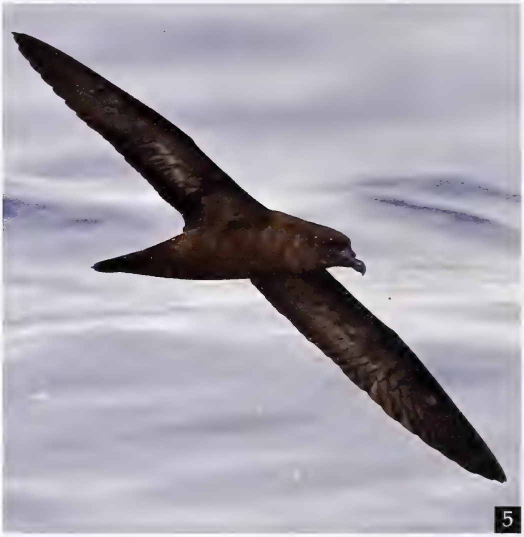

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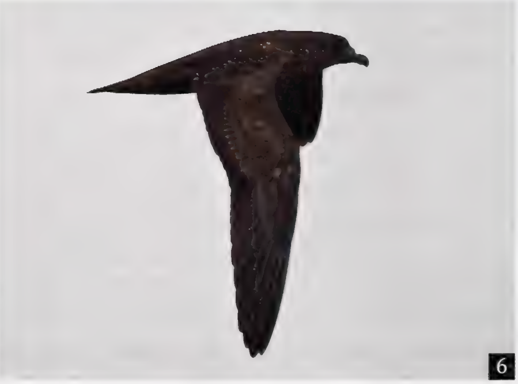

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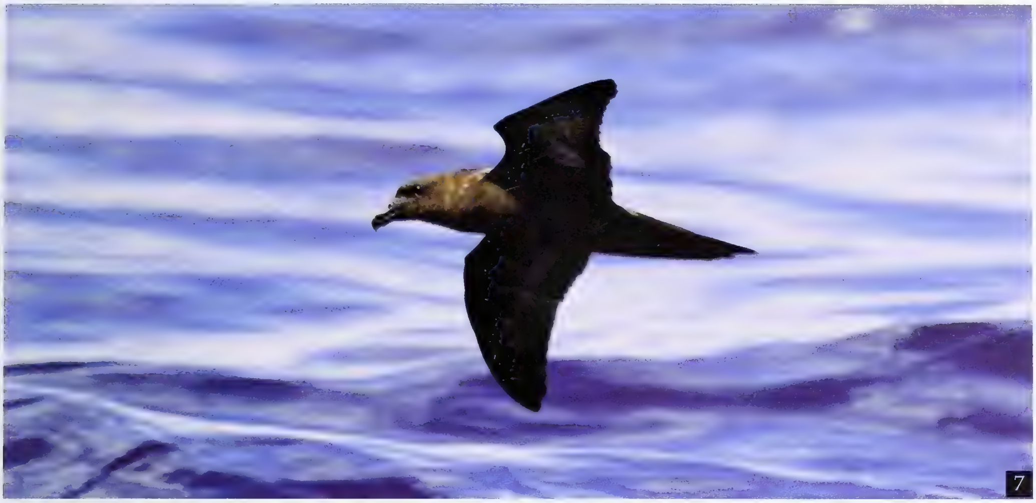

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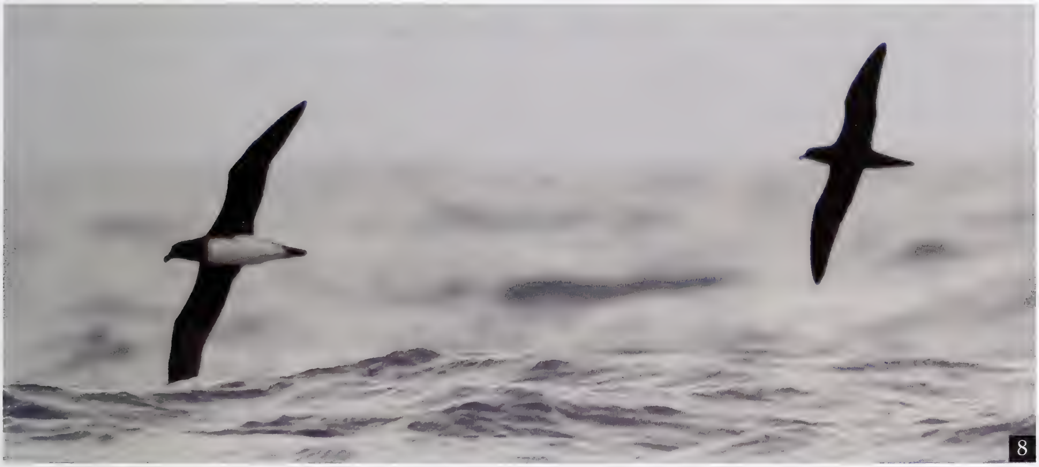

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Figure 4. Fiji Petrel *Pseudobulweria macgillivrayi*, off Gau, Fiji, 13 May 2009. Another photograph of bird 2 while gliding, showing dorsal coloration to be generally concolorous and lacking any pattern (Hadoram Shirihai)

Figure 5. Fiji Petrel *Pseudobulweria macgillivrayi*, off Gau, Fiji, 13 May 2009. Another photograph of bird 2 during its slow flight investigating the 'chum slick'. The slim elongated body with tapering rear end, and particularly long slim wings, are evident. The underwing is virtually uniform, lacking any distinct pale elements, and the underparts show a very slight rusty hue with some paler feathering giving a subtle effect of diffuse barring (Hadoram Shirihai)

Figure 6. Fiji Petrel *Pseudobulweria macgillivrayi*, off Gau, Fiji, 13 May 2009. Bird 2 in profile; gentle wing flapping during a shallow glide. Note the sharp forehead, relatively large bulbous bill, and slim, very pointed rear body and tail. The outermost two secondaries are new, appearing darker, suggesting it is at least second-year or older, and possibly adult (Hadoram Shirihai)

Figure 7. Fiji Petrel *Pseudobulweria macgillivrayi*, off Gau, Fiji, 17 May 2009. Bird 6 flying low over the water, showing how in sunny conditions the plumage appears richer brown. The wing-coverts can appear misleadingly pale, even creating an underwing panel, which is an illusory effect due to light reflecting off the water surface (see text). Further images of the same bird show it lacking the pale panel effect (Hadoram Shirihai)

Figure 8. Tahiti Petrel *Pseudobulweria rostrata* (front) with Fiji Petrel *P. macgillivrayi*, off Gau, Fiji, 13 May 2009. Bird 2 in the background, behind the much larger and heavier Tahiti Petrel. Despite being much smaller, note Fiji Petrel's distinctive silhouette with slim body, elongated thinly pointed rear section, and very long narrow wings (Jörg Kretzschmar)

wear, abrasion or earlier generation feathers. *Immature and adult*—The other nine (five grounded and four at sea) belong to these age classes. All show, to varying degrees, mixed-generation feathers, although in most many of the remiges and rectrices are of the same generation. Four birds ('grounded birds' 1 and 5, and birds 1 and 6) have 2–3 newer (fresher / darker) outer secondaries, and one has a single fresher inner primary. If no moult occurs in the first year (like most petrels) we can affirm that most of these birds are second-year or older. We suspect that adults will undertake a complete post-breeding moult with limited or no feather retention. However, because we know virtually nothing about the biology of Fiji Petrel, to confirm moult sequence and changes in moult pattern through age, two options exist. Either these are non-breeding immatures (second-year or older) or breeding adults that appear to have completely moulted during the post-breeding (or a non-breeding) season, with recent additional or delayed and restricted partial (suspended?) moult just prior to the next breeding season. The only bird in active moult of the remiges is 'grounded bird' 4, which had some unmoulted flight-feathers and coverts of weaker and softer texture (probably juvenile-retained); it was probably undertaking its first complete moult. Without handling the bird (and further knowledge of the species' moult and ageing) its age is best considered uncertain.

Field identification

This depends on an ability to critically judge true size, colour and structure, whilst taking into account the effects of light and other conditions, and the observers' experience with other species. Fiji waters attract an assortment of dark species of petrels and shearwaters (see Appendix 3). Those that could be confused with Fiji Petrel, even by the most experienced observer, are discussed below. Suspected Fiji Petrels away from Fiji waters will be difficult to prove unless well photographed and their size evaluated through direct comparison with nearby petrels.

Potential confusion with seabirds common in Fiji waters.—Several locally breeding seabirds are dark or chiefly dark. *Tahiti Petrel*—Given reasonable views is unmistakable, and its much larger size and white belly easily identify the species from Fiji Petrel. However, Tahiti shares several structural and flight characteristics with Fiji Petrel, and when size and colour are difficult to judge, this species should be considered. At first glance, a Tahiti sometimes looks small and darker overall and the white belly can be invisible, due to the combination of bright sunlight and distant views. *Collared Petrel* (dark morph)—Again, unlikely to be confused with Fiji Petrel, unless seen briefly or distantly. The white forehead and throat, and mostly white underwing with narrow dark diagonal bar, eliminate Fiji Petrel. Frequently, we had extremely dark examples of Collared approach the boat in low flight and side view, thereby revealing neither the underwing nor the rounder, shorter wings, and appearing initially like an all-dark small petrel. *Brown Noddy* Anous stolidus and *Black Noddy*—Despite being terns, these mostly brown to dull black seabirds are also slim and long-winged. Often they perform short, petrel-like, glides, but their typical shape and almost constant flapping flight should be swiftly apparent. At closer ranges, the thin tern-like bill and whitish cap are evident.

Bulwer's and Jouanin's Petrels.—Any claim of Fiji Petrel needs to be critically separated from the two *Bulweria* petrels, *Bulweria bulwerii* and *B. fallax*. Both these graceful flyers have long slim wings and distinctly elongated rear bodies, as well as all-dark plumage. Bulwer's is widespread in tropical oceans, but seems rare off Fiji and in nearby waters, whilst Jouanin's occurs mostly in the western Indian Ocean, though vagrants have been reported off Western Australia three times (www.users.bigpond.net.au/palliser/

barc/case349.html; www.users.bigpond.net.au/palliser/barc/case363.html; www.users.bigpond.net.au/palliser/barc/SUMM458.html) and twice in Hawaii (Seto *et al.* 1996). These *Bulweria* often possess a diagnostic pale panel on the greater upperwing-coverts, but this is highly variable and can alter with angle and light, as well as feather wear. Our observations (HS and TP) show that many *Bulweria* can possess a reduced pale panel, indeed so reduced on some to appear lacking! Identification must rely on correct evaluation of size and shape: compared to Fiji, Bulwer's is smaller with shorter wings (total length *c.*27 cm, wingspan *c.*70.5 cm) but the larger Jouanin's is closer in size to Fiji (total length *c.*31 cm, wingspan *c.*79 cm). Experienced observers should differentiate Fiji Petrel and the two *Bulweria* by their characteristic flights. Fiji Petrel, a *Pseudobulweria* with proportionately longer wings held stiffly, has a less erratic flight, whereas *Bulweria* fly low to the water, zigzag, change height and alter direction rapidly with short glides and arcs. In close views, *Bulweria* have rather smaller, squarer shaped, storm petrel-like heads, with a high forehead and a bill clearly narrower than in Fiji Petrel. We should emphasise that correct evaluation of bill structure at sea requires prolonged and close observation, but can be assessed up to 100 m away, even further in especially favourable conditions. Also, when *Bulweria* are seen in profile, with the tail fully folded, the projection of the rear body and the tail, beyond the wings' trailing edge, is almost (up to) double that of the fore body to the bill tip, forward of the leading edge (in photographs, 50–90% longer). In Fiji Petrel the rear section is only *c.*30% longer. However, these proportions should be used cautiously: for example, the tail of *Bulweria* can appear misleadingly shorter due to wear, and the profile of a flying bird may alter with its flight mode. Furthermore, in *Bulweria* the rear body and tail taper less abruptly than in Fiji, and the bodies of both, especially Jouanin's, appear slimmer and flatter bellied, resulting in a straighter profile.

***Christmas (Kiritimati) Shearwater*.**—Tropical Pacific *Puffinus nativitatis* is probably rare in Fijian waters (see Appendix 3), but as likely to be encountered as Fiji Petrel. During extensive observations, HS found that this species is the most likely to be confused with Fiji Petrel. It is almost uniform dark brown, with a similarly indistinct colour and pattern, e.g. a slight rusty tinge to the body that Fiji Petrel also possesses. It has a similar wingspan (*c.*75 cm) and, despite being short-tailed, also has a tapering rear body, with the folded tail narrowing to a point, which profile resembles Fiji Petrel. *Contra* most literature, this shearwater sometimes flies languidly with slow and easy flaps, and shallow glides, on slim and supple wings. It is essential to check bill structure and confirm if this is thin and typical of a shearwater, or thick, bulbous and petrel-like, although this might not always be easy. Christmas Shearwater has an angular head profile, like many *Puffinus*, and tends to show pale upperwing-covert fringes, as well as having feet that project slightly beyond the tail. When this shearwater is seen well, Fiji Petrel is easily dismissed.

***Mascarene Petrel*.**—All-dark *Pseudobulweria aterrima* may be the closest relative of Fiji Petrel and is the second-largest *Pseudobulweria* (total length *c.*36 cm, wingspan *c.*88 cm). It is known only from Réunion in the western Indian Ocean and, because it is very rare, the possibility of it reaching Fiji waters is unlikely. However, the possibility of vagrancy of Fiji and Mascarene Petrels to the south-west Pacific and south-east Indian Oceans (e.g. off southern or south-east Australia) cannot be excluded. Only one of us (HS) has seen Mascarene, both as specimens and at sea, though all of us have examined photographs of grounded birds from Réunion. On present, admittedly very limited, experience, we believe that they are virtually identical in structure and plumage, but they differ markedly in size. Claimed records of either species away from their breeding islands must pass a very stringent size evaluation.

Taxonomy

The genus *Pseudobulweria* was initially erected for Fiji Petrel by Mathews (1936). The species' genetic relationships are currently unknown, although *macgillivrayi* is currently being sequenced together with *aterrima*, *rostrata* and *becki* (Bretagnolle *et al.* in prep. b), which will classify for the first time all four *Pseudobulweria*. Bretagnolle *et al.* (1998) confirmed the validity of *Pseudobulweria*, showing it to be sister to *Puffinus* and *Calonectris*, which genera in turn are most closely related to *Bulweria* and *Procellaria*. Our observations confirm that structurally and behaviourally Fiji Petrel is correctly placed in *Pseudobulweria*, and that it shares many features with the much larger *rostrata*. Measurements of the four Fiji Petrel specimens appear in Table 1. To compare these with other taxa in *Pseudobulweria* refer to Villard *et al.* (2006) for *rostrata*, Attié *et al.* (1997) for *aterrima*, and Shirihai (2008a) for *becki*.

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APPENDIX 1: Previous records of grounded Fiji Petrels

Priddel *et al.* (2008) detailed past records of Fiji Petrel. We add new information from recent examination of all museum specimens and photographs of collected or grounded birds. New data, especially concerning moult and ageing, add to deliberations on the breeding season. Previous records of grounded birds were important in planning our work (see Methodology).

Holotype.—The medical doctor aboard *HMS Herald*, Dr F. M. Rayner, obtained the holotype, which is held in The Natural History Museum (Tring), during a visit to Gau in October 1855. Bourne (1965, 1981) and Imber (1985) reported that it was a recently fledged juvenile, with flight-feathers not fully developed and non-fused pre-frontal skull morphology, which interpretation was accepted by Priddel *et al.* (2003, 2008). M. J. Imber (*in litt.* 2009) also referred to his notes, wherein he had recorded that the specimen had some down feathers, but these now seem to be lacking (perhaps lost during subsequent handling). However, recent examination by HS revealed that the bird appears to lack fresh plumage, with very worn and bleached greater upperwing-coverts. Lack of any moult contrast (i.e. different feather generations) often does indicate a juvenile petrel, and both W. R. P. Bourne (*in litt.* 2009) and M. J. Imber (*in litt.* 2009) thought that wear on the coverts could be explained by nesting burrow abrasion and / or poor handling. However, unlike the strong wear of this particular specimen, the most recently grounded fledgling (January 2009) has typically very fresh plumage, including all wing-coverts. The extent of wear in the type is similar to another HS examined, an adult (or at least second-year) from April 2007 (see below). These uncertainties and current lack of knowledge of moult and ageing of the species, and *Pseudobulweria* as a whole, hinder the theory that the holotype is unquestionably a fledgling. If it is a juvenile, then the relatively small size could be explained by it being a male. Conversely, if it is not a juvenile, questions arise as to why an adult male is the smallest of the four available specimens. We are unsure if the fact that p9>p10 in the holotype can be attributed to the flight-feathers being not yet fully developed, as the fledgling (2009) had p10 longest like the adult / immature (2007). Interestingly, the four birds photographed at sea had wing formulae like the type (p9>p10). The simplest explanation to the above discrepancies is that the specimen is a fledgling, as both Bourne and Imber concluded, but with exceptionally abraded coverts. We recommend that the type specimen be checked again and be compared genetically with recent specimens, to remove lingering doubts. See Table 1.

Grounded birds on Gau.—*1965*: A Fiji Petrel landed in Nukuloa village, and was examined by KM and B. Palmer, the head of the Fiji Museum at the time, but unfortunately no specific date is known, and no photographs or measurements were taken. Priddel *et al.* (2008) regarded this record as acceptable.

1984: DW had the extraordinary experience of a bird crash-landing into him while spotlighting on 30 April (Watling & Lewanavanua 1985). In our view this record ('grounded bird' 1) marks the rediscovery, after *c.*130 years, as it was confirmed with photographs and measurements. To the islanders of Gau Fiji Petrel was never a 'lost bird' and Ratu Filipe Lewanavanua, paramount chief of Gau, had much influence, including spiritual, in the belief that the petrel awaited rediscovery (Watling 1986c). Photographs reveal it was probably an adult (or immature, second-year or older): the left wing has two newer and distinctly darker outer secondaries and there appears to be mixed feather generations in the upperwing-coverts and upperparts. The plumage is moderately worn on the greater coverts and primary tips and, if a breeding adult, suggests the bird was caught early in the breeding season.

1985: In April or May, a Fiji Petrel was reported in Nukuloa village but there are no further details. A second bird ('grounded bird' 2) flew into lights at Nukuloa on 3 July 1985 and died a week later. It was deposited in the Fiji Museum by DW, and preserved in formalin. In July 2008, this specimen was re-examined by HS but it was difficult to inspect moult and to age the bird, though overall the plumage, including the primaries, appeared rather fresh with no apparent moult limits or gaps in wing or tail. According to Priddel *et al.* (2008), W. Boles, Curator of the Ornithology Section at the Australian Museum, aged it as young adult female that had not bred yet (the oviduct was thin and straight, and the ovary, 5 × 3 mm, smooth). Thus, it could have been a non-breeding adult or immature, perhaps making an early exploration of the island.

1987–2001: Priddel *et al.* (2008) listed six petrels crash-landing onto roofs in Nukuloa and Nawaikama villages, but none is documented photographically and no measurements were taken. These include four that Priddel *et al.* (2008) regarded as confirmed (examined by KM): two in 1987 (30 July and 11 October); one in 1989 (18 December); and one in 1990 (no date). Two later ones, considered doubtful, involved singles in 1990 (no date) and December 2000. Only three, those in 1987 and 1989, were released safely back to the wild.

2002: On 29 December, a Fiji Petrel landed on a roof at Nukuloa village. It was photographed ('grounded bird' 3), unfortunately died and was not retained. Image quality is too poor to permit moult assessment and ageing, but HS considers it to be possibly an adult (or an immature, at least second-year), based on contrasting feathers in the wing and body, suggesting different generations, apparently noticeably worn greater wing-coverts, and what appears to be highly bleached outer primary tips. Also in December a bird was reported to have landed at Lamiti, the only record from eastern Gau. It apparently died and was not retained. Priddel *et al.* (2008) reviewed this incident with scepticism.

2003: There are unconfirmed reports that possible Fiji Petrels grounded in June, one in Lovu and the other at Nacavanadi. Neither village has had grounded birds in the past, or since, and details are lacking. Priddel *et al.* (2008) were sceptical of both records.

2005: On 4 May two were seen in Sawaieke village. One flew off the same evening and the other, captured by local children and of which several photographs exist, was released next day ('grounded bird' 4). It is the only record of two together. Examination by HS of the photographs show that the bird was in progressive moult, missing three inner primaries on both wings and had a growing primary visible on the right wing. Separate feather generations were noted on the body, upperwing-coverts and tail. The older unmoulted feathers appear weak, and of softer texture, and could be juvenile-retained. The bird may have been adult (Priddel *et al.* 2008), but it is unlikely that it was a breeder given moult stage. It may have been a non-breeding immature whose moult would be earlier than breeders. Conceivably, both birds were inexperienced, returning perhaps for the first time, and having limited familiarity of the island were more likely to become disoriented by village lights.

2007: On 12 April, a bird landed in Levuka village. This individual was kept in captivity but died on 19 April ('grounded bird' 5). In August 2007, while processing the specimen, W. Boles (*in* Priddel *et al.* 2008) concluded it was an adult female that had not yet bred. Examination by HS revealed the following: all remiges appear to be single generation and are slightly to moderately worn, but the longest primary tips are very worn (probably due to poor handling). Greater secondary-coverts and some tertials are considerably worn. Among the tertials and scapulars there are single new feathers and on the left wing one secondary is new; these are much blacker and clearly distinct from older feathers. The greater secondary-coverts are heavily worn and bleached, and conceal the fresh greater primary-coverts. Thus again, it was possibly a non-breeding adult or immature (second year or older) that had moulted completely with recent additional, delayed and restricted partial (suspended?) moult, just prior to the next breeding season.

2009: One in Levuka village on 19 January 2009 died shortly afterwards ('grounded bird' 6) and was transferred to DW in Suva. Partially frozen, it was examined by HS. The examination revealed all remiges and rectrices to be very fresh and of the same generation, but with very minor wear, and the greater-coverts had a paler brownish tinge, perhaps due to some wear as a nestling. It had a few downy feathers on the crown and neck-sides, so clearly was a recently fledged juvenile.

APPENDIX 2: Past records and efforts to see Fiji Petrel at sea

Past claims at sea.—Priddel *et al.* (2008) re-examined claimed records (all post-1960) and concluded that none is substantiated. These included four observations of small dark petrels that could have been Fiji Petrels (8 November, 31 December 1964, and 1 January, 23 May 1965; summarised in Bourne 1965), but might have been Bulwer's Petrel. Also included was an unconfirmed record, from 12 June 1986, by DW of a bird near the reef off north-west Gau. Onley & Scofield (2007) noted Fiji Petrel 'at sea near Gau and from 200 km north of Gau but believed to disperse to pelagic waters far from the island'. We cannot confirm or deny this statement and we are uncertain if the same source made the comment 'pale lustre to the underwing' in their description (see Plumage). We agree with Priddel *et al.* (2008) that there were no genuine records of Fiji Petrel at sea, prior to ours in May 2009.

Recent records of Fiji-like Petrels elsewhere.—Shirihai (2008a) described three dark petrels observed in the Bismarck archipelago, Papua New Guinea, which were noted as 'Fiji-like Petrels'; one in August 2003, one in July 2007 and another in August 2007. All three had a *Pseudobulweria*-like structure, resembling Beck's Petrel in shape, but two seemed slightly smaller overall, despite appearing more robust, larger headed and particularly heavier billed. Plumage was predominantly dark brown, slightly darker on the head / face, and they had fractionally paler fringes to the upperwing-coverts, though these did not create a carpal bar. Underwing was almost uniformly dark, perhaps with a paler / greyer tone, though this was partially attributed to the effect of strong sunlight. Until now, there were no photographs or even a basic description of Fiji Petrel's appearance and behaviour at sea for comparison. Shirihai (2008a) cautiously regarded these sightings as uncertain; they could even represent an undescribed *Pseudobulweria*. Following the 2009 expedition HS can confirm that on shape and flight behaviour, especially jizz, the Bismarck birds were not the same, and prefers to retain them as 'unidentified dark *Pseudobulweria* petrels'. Howell (2007) saw an unidentified dark petrel, suspected by him to be Fiji Petrel, in the same general area in April 2007. On the Western Pacific Odyssey cruise, April 2008, another all-dark petrel was logged, but we cannot validate either sighting without further details from Howell and the other observers aboard.

Previous attempts to find Fiji Petrel at sea.—Aside from the efforts to locate Fiji Petrels ashore on Gau (Watling & Lewanavanua 1985, Priddel *et al.* 2008), three earlier attempts targeted Fiji Petrel at sea. DW chartered a yacht and searched Gau waters unsuccessfully for a week in 1986. HS arrived in Fiji on 17 July 2005 for three weeks, to search the archipelago, especially around Gau. The *Turagalevu* was chartered and the 'chum' loaded, but the weather was unusually rough, with frequent rain and storms, and the expedition could only operate on a few days. In July 2008, HS, TP, JK and DW (with others from the UK, Australia and Sweden) made a third attempt to locate Fiji Petrel at sea, this time using the *Summer Spirit* with two tonnes of 'chum' aboard. This journey was aborted after just three days due to mechanical problems with the boat. Two 'chumming' sessions did produce six Kermadec Petrels and two Polynesian Storm Petrels *Nesofregetta fuliginosa*. Twice, some of the team saw a '*Cookilaria*-sized' dark petrel. The first 'chumming', south-west of Gau, recorded a steady stream of petrels, mostly Tahiti and Collared Petrels, moving in the direction of breeding islands further north in the archipelago (Fig. 1). Following the boat's technical problems, the team flew to Taveuni to try for seabirds there and, whilst aboard the *HiFlyer*, recorded White-bellied Storm Petrel *Fregetta grallaria* and at dusk a gathering of Tahiti Petrels in the Somosomo Strait, waiting to return to their burrows ashore.

APPENDIX 3: Other tubenoses recorded in July 2008 and May 2009

A passage of petrels was noted, apparently from feeding grounds south of Fiji (Fig. 1). The vast majority were Tahiti and Collared Petrels but other less common species were involved. Since this passage occurs mostly after 14.00 h, during late afternoon and evening especially, we assume it involves mostly birds breeding on nearby islands: on Gau (Collared Petrels) and islands further north (Tahiti and Collared Petrels). In the context of finding Fiji Petrels at sea, we saw great advantage in that this 'rush hour' occurred near Gau (see Methodology). We collected data on the timing and number of these birds, as well as weather patterns, for a future publication wherein we will discuss the relationship of weather to these movements. For now, we note that this passage is changeable and can drift further east of Gau. Highest numbers of individuals and diversity of species occur in south-east winds and extensive cloud cover, but in sunny conditions and winds from the north or west we found the sea lacking in tubenoses. This area might prove to be a 'hotspot' for seabirds, and further work should increase our knowledge of some of these species. Table 2 provides daily (conservative) estimates for each species and maximum counts in 2009, mostly during 'chumming' (see Methods), with notes on each species included below; current status in Fijian waters comes from the records of DW.

Murphy's Petrel *Pterodroma ultima* One photographed on 16 May 2009. There are no known records from Fiji and the literature (e.g. Murphy 1930, Murphy & Mowbray 1951, Murphy & Pennoyer 1952, Bourne 1965, Bourne & Dixon 1971, Marchant & Higgins 1990) suggests this record is also the first for the Western Pacific. This is an extraordinary record of vagrancy by a species that breeds no closer than the western Tuamotu archipelago (HS pers. obs.), 2,000 km east of Fiji, and usually migrates north and east of the breeding islands. The typical underwing pattern, duskier hood, scaly upperparts with bluish-grey tinge, and well-developed dark upperwing 'M', make this record undeniable. The photograph was compared with HS's photo collection of *ultima* (>300 birds) from Henderson and Oeno islands.

Kermadec Petrel *P. neglecta* Birds varied from very pale to all dark. It breeds as close as the islands of Kermadec, Lord Howe and Tonga, but is a vagrant to mainland New Zealand and eastern Australia. We observed it in 2005, 2008 and 2009 and believe it to be regular in Fiji waters, and that it may breed. Characteristic feeding behaviour, chasing other petrels in the manner of skuas, was observed. The dark morph is easily separated from Fiji Petrel by its distinctly larger size, broader wing and shorter and rounder tail. Even the darkest examples show white primary bases (lacking in Fiji Petrel).

Phoenix Petrel *P. alba* One on 21 May 2009 apparently is the first confirmed record for Fiji waters. Observers may be confused with respect to variation within the Herald Petrel *P. heraldica* complex, and the species seems always to be compared directly with Tahiti Petrel. This is misleading, though frequently repeated even in recent literature, e.g. Onley & Scofield (2007). A full review of the identification and variation of the *neglecta-heraldica-alba* complex will be given in Shirihai & Bretagnolle (in prep.).

Mottled Petrel *P. inexpectata* This long-distance migrant moves from breeding grounds in New Zealand to the North Pacific, but has seldom been recorded in Fiji waters. It was seen (and photographed) almost daily in 2009.

White-necked Petrel *P. cervicalis* One briefly inspected the 'chum' on 18 July 2008. The bird might have been a Vanuatu Petrel *P. occulta*, although it was seen alongside several other species and appeared too large.

TABLE 2

Daily counts of Procellariidae in 2009. Numbers in parenthesis refer to maximum numbers of birds seen together, at 'chum'. Details of individual count sessions with species / numbers are available from the authors. Note: 12 May data refer to observations en route between Suva, Viti Levu, to Gau Island.

	12 May	13 May	14 May	15 May	16 May	17 May	18 May	19 May	20 May	21 May	22 May
Murphy's Petrel *Pterodroma ultima*					1						
Kermadec Petrel *P. neglecta*			1	4	1					2	2
Phoenix Petrel *P. alba*										1	
Mottled Petrel *P. inexpectata*		>2	1	3	2		3	1	1	2	
Black-winged Petrel *P. nigripennis*			1		1						
Gould's Petrel *P. leucoptera*		6	>5	6	1	3			1	2	2
Collared Petrel *P. brevipes*		>80 (13)	>40 (12)	>40 (5)	>60 (12)	>80 (8)	>40 (6)	>5	>10 (3)	>15 (4)	>100 (13)
Tahiti Petrel *Pseudobulweria rostrata*	1	>100 (11)	>50 (8)	>70 (12)	>100 (14)	>70 (14)	>50 (12)	>10	>15 (4)	>35 (4)	>100 (17)
Fiji Petrel ***P. macgillivrayi***		**3**	**1**		**1**	**2**	**1**				
Parkinson's (Black) Petrel *Procellaria parkinsoni*						1					
Christmas Shearwater *Puffinus nativitatis*	1										
Wedge-tailed Shearwater *P. pacificus*		15 +/-		2		1	6	2	1	1	2
Buller's Shearwater *P. bulleri*		1									1
Sooty Shearwater *P. griseus*		1		3	1	1	2 +/-	1	2	2	1
Flesh-footed Shearwater *P. carneipes*										1	
Wilson's Storm Petrel *Oceanites oceanicus*			3 (2)					1	1		1
White-faced Storm Petrel *Pelagodroma marina*					1						
Black-bellied Storm Petrel *Fregetta tropica*					1						
Polynesian Storm Petrel *Nesofregetta fuliginosa*			1								
Matsudaira's Storm Petrel *Oceanodroma matsudairae*		1									

Vanuatu Petrel has been identified once at sea only, between New Caledonia and Vanuatu, in January 2006 (HS). Both species can be expected in Fiji waters.

Black-winged Petrel *P. nigripennis* Two; one in fresh plumage, the other in heavy moult. The species' status is uncertain in Fiji waters, where it is little known, despite breeding as close as New Caledonia, Tonga and the Kermadec Islands.

Gould's Petrel *P. leucoptera* A few seen, almost daily, amongst the many *P. brevipes*, with which it was considered conspecific in the past. All were *P. l. caledonica*. The paucity of records in Fiji waters may be attributable to a lack of knowledge in separating it from pale-phase *P. brevipes*. The possibility that *P.*

leucoptera also breeds in Fiji cannot be excluded as, apart from New Caledonia, Cabbage Tree Island (off New South Wales, Australia), and possibly Vanuatu, the species has now been found breeding far to the east, in south-east (French) Polynesia (Bretagnolle *et al.* in prep. c).

Collared Petrel *P. brevipes* Numbers increased during the late afternoon, suggesting most were breeders from Gau. Notes on plumage variation will be published in Bretagnolle *et al.* (in prep. c) and Shirihai & Bretagnolle (in prep.); 10% were dark-bellied birds (17% noted by Watling 1986a).

Tahiti Petrel *Pseudobulweria rostrata* The most frequent petrel. Most are believed to breed in northern Fiji, e.g. on Taveuni. In the area surveyed this large petrel was the most dominant and aggressive at 'chum'. Although recorded ashore on Gau (Plant *et al.* 1989), breeding has not been recorded and we did not see Tahiti Petrels massing off Gau in the evenings, in either year. If it does breed it could be a potential competitor with Fiji Petrel for burrows.

Parkinson's (Black) Petrel *Procellaria parkinsoni* Our observation (Table 2) of this New Zealand endemic breeder is the first for Fiji waters.

Christmas (Kiritimati) Shearwater *Puffinus nativitatis* A bird seen en route to Gau (12 May 2009) is the second for Fiji waters.

Wedge-tailed Shearwater *P. pacificus* Breeds on many islands in Fiji, including Gau, but relatively few seen (Table 2), all of the dark morph, and we are unaware of pale forms in the region. The inexperienced observer could confuse dark *pacificus* with Fiji Petrel, but it is a typical shearwater with a long slim bill, and is distinctly larger. Distantly, or at first glance, Wedge-tailed can show a petrel-like silhouette but we never found size problematic to judge.

Buller's Shearwater *P. bulleri* Observed on two days in 2009. Only three previous records in Fiji waters.

Sooty Shearwater *P. griseus* Few seen on most days. Some showed quite dark underwings, had apparently short bills, and their feet projected beyond the tail in flight. We mistook some as Short-tailed Shearwaters *P. tenuirostris* and these odd birds require future attention. Both shearwaters are regular in Fiji waters. Sooty Shearwater is also readily distinguished from Fiji Petrel by its much larger size, typical shearwater shape and flight, long thin bill and shorter tail. Most show pale panels on the underwings, unlike Fiji Petrel, but confusingly some are virtually all dark. Perhaps, in brief and distant views, or for inexperienced observers, these could be confused, albeit briefly.

Flesh-footed Shearwater *P. carneipes* Surprisingly, our 21 May 2009 sighting is only the second in Fiji waters; the first was a bird captured off Gau, in February 2009 (NFMV 2009b). Despite its almost uniform body and underwing, the species should be easy to separate by its large size, proportions, and long thin bill with pinkish base.

Wilson's Storm Petrel *Oceanites oceanicus* Observed on four days, always at the 'chum'.

White-faced Storm Petrel *Pelagodroma marina* A single at the 'chum' on 16 May 2009 had the pale, virtually whitish-grey, rump apparently associated with *P.* (*m.*) *albiclunis*, which breeds on the Kermadec Islands, New Zealand and possibly Norfolk Island, Australia. There are two previous records of this species from Fiji waters.

White-bellied Storm Petrel *Fregetta grallaria* We photographed the first for Fiji waters, in July 2008, off Taveuni Island.

Black-bellied Storm Petrel *F. tropica* One at the 'chum' on 16 May 2009, the second confirmed record in Fiji waters.

Polynesian Storm Petrel *Nesofregetta fuliginosa* This attractive storm petrel was first recorded in Fiji from a bird taken on the nest in September 1876 on Kadavu Island (Finsch 1877). There were no further confirmed records until 19 July 2008, when we photographed a bird at the 'chum', with another on 14 May 2009.

Matsudaira's Storm Petrel *Oceanodroma matsudairae* The first record for Fiji waters of this Japanese breeder (and Indo-Pacific migrant) was on 13 May 2009. The closest region where the species is regular is the Bismarck archipelago, Papua New Guinea.

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A new subspecies of Gurney's Hawk *Buteo poecilochrous*

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Summary.—A new subspecies of Gurney's Hawk *Buteo poecilochrous* is recognised for populations of the species from northern Peru and western Bolivia to north-west Argentina and northern Chile. Specimen analysis reveals that they differ in size and plumage from northernmost populations, in south Colombia to south Ecuador. The new subspecies is slightly smaller in body measurements and in definitive plumage has the grey-feathered areas darker and more slate-coloured than the nominate subspecies. Furthermore, pale- and dark-morph females possess a more extensive dorsal patch; the pale morph has white central underparts and finely barred or vermiculated sides, whilst in juveniles, in general, these areas are warm brown with rusty or cinnamon markings. In the nominate form, by contrast, the underparts are usually darker brown with creamy or whitish markings.

Buteo poecilochrous is a high-Andean hawk found from southern Colombia to northern Argentina and Chile (Fjeldså & Krabbe 1990). Gurney (1879) mentioned Yauayacu, in Ecuador, as the type locality. This name cannot be located on any map, but Cabot & de Vries (2005) considered it to be a transcription error of the Quecha name 'Yanayacu', which is a village in Ecuador (01°25'S, 78°39 W). Further evidence to support this proposition can be found in Sclater & Salvin (1880), wherein it is stated that Clarence Buckley, who collected the type specimen, took the greater part of his 10,000 Ecuadorian specimens along 'the upper branches of the Rio Pastaza, and on the spurs lying between this stream and its affluent the Bobonaza, Mr Buckley's headquarters having been during the greater part of the time the village Sarayacu on the latter stream, which must be carefully distinguished from the place of the same name on the Ucayali.'

Here, we firstly justify the recognition of *B. poecilochrous* as a species separate from Variable Hawk *B. polyosoma*, and then proceed to describe a new subspecies of Gurney's Hawk from the *puna* and high Andes above 3,000 m, from northern Peru (Marañón Valley and the Porculla pass) south to north-west Argentina and northern Chile. The nominate subspecies is restricted to the *páramos* of southern Colombia to southern Ecuador. The recognition of the new subspecies is based on Mayr (1963) who defined a subspecies as 'an aggregate of local populations of a species inhabiting a geographic subdivision of the range of the species, and differing taxonomically from other populations of the species'. The vernacular name Gurney's Hawk *Buteo poecilochrous* is employed in this paper following Jiménez & Jaksić (1990) and Jaksić *et al.* (1991), as well as our own proposal (Cabot & de Vries in press).

Taxonomic status of *B. poecilochrous*

We take this opportunity to reiterate that *B. poecilochrous* and *B. polyosoma* are distinct species in accordance with the Biological Species Concept, as proposed by Cabot & de Vries (2003) but contrary to Farquhar (1998). Furthermore, we clarify the following points. The two species are of different size with different biometrics. There is evident sexual dimorphism but the wing lengths of the two species do not overlap in either sex, although that of some female *B. polyosoma* may overlap those of male *B. poecilochrous* (Cabot & de Vries 2003;

Fig. 4). The clinal gradient in body size related to altitude proposed by Farquhar (1998) does not exist. Each taxon is morphologically different (Cabot 1991, Cabot & de Vries 2003). No intermediates have been detected. Farquhar (1998) observed that geographical size differences vary from one species to the other. In *B. poecilochrous* the northern form is larger than the southern taxon, contrary to Bergmann's Rule (this study), whereas in *B. polyosoma* the largest forms occur in southern South America and on islands such as the Juan Fernández (de Vries 1973, Jiménez 1995, Cabot & de Vries 2003). Some individuals of *B. polyosoma* in the lowlands of south-west Ecuador and extreme north-west Peru (*'peruviensis'*) are smaller than the intermediate Andean form found at the same latitude but which is apparently separated by altitude with no known overlap (Buitrón-Jurado *et al.* in press).

The two species are separable by plumage characters. There are two colour morphs in *B. polyosoma,* and age-related changes in plumage occur in both *B. polyosoma* and *B. poecilochrous* (Cabot & de Vries 2004, 2005). In *B. poecilochrous*, adult females, immatures and some males of both colour morphs possess heavy dark barring on the tertials, secondaries and all wing-coverts, not unlike those in Black-chested Buzzard-Eagle *Geranoaetus melanoleucus*. In *B. polyosoma* obvious and extensive barring on the upperparts is usually absent (Fig. 1), being faint, pale and more restricted to the secondaries. In both species, age- and sex-related plumage types resemble one another more in pale morphs (Fig. 2) than in dark morphs (Fig. 3), although diagnostic differences are still evident (Cabot & de Vries 2004).

The two species occupy different habitats where they occur in sympatry. *B. poecilochrous* occurs in grassy *páramos*, *puna* steppe and on montane ridges, usually >3,000 m, whereas *B. polyosoma* inhabits more xeric, scrubby and forested habitats, usually between sea level and 3,000 m, although it is occasionally found above 4,000 m (Cabot 1991). Recently, in the Atacama Desert of Chile, a population of *B. poecilochrous* was discovered in the river gorges that dissect the pre-Cordilleran plains, in which region *B. polyosoma* occurs in more brushy areas with scattered trees or open forests, as well as in neighbouring desert scrub beyond fluvial environments (Cabot *et al.* submitted).

Lerner *et al.* (2008) treated *B. polyosoma* and *B. poecilochrous* as species derived independently from White-tailed Hawk *B. albicaudatus*. The lack of genetic divergence between the two species does not automatically indicate conspecificity, as has been clearly shown for Galápagos *B. galapagoensis* and Swainson's Hawks *B. swainsoni* (Hull *et al.* 2008).

Finally, we emphasise that the dark morph of *B. polyosoma* has marked sexual dimorphism: females are all grey or blackish grey with a broad uniform reddish breast-band, whereas males have uniform grey underparts (Fig. 1) (Cabot & de Vries 2003, 2004). In *B. poecilochrous* the underparts of both sexes are similar in both morphs: in the pale morph, both sexes are white below (Figs. 6–7), whereas in the dark morph they are grey and white (Figs. 4–5). In the latter morph the sexes often show the same patterns of marks and bars.

Methods

We examined 73 specimens of *B. poecilochrous* held at the following institutions: Museo de la Universidad del Cauca (Popayán); Instituto de Ciencias Naturales, Universidad Nacional de Colombia (Bogotá; ICN); Museo Ecuatoriano de Ciencias Naturales (Quito); Museo de Ciencias Naturales del Instituto 'Mejía' (Quito); Museo de la Escuela Politécnica Nacional (Quito; MCNQ); Museo Nacional de Ciencias del Instituto Técnico Superior 'Bolívar' (Ambato); Universidad Nacional (Quito); The Natural History Museum (Tring; BMNH); Institut Royal des Sciences Naturelles de Belgique (Brussels; IRSNB); Muséum National d'Histoire Naturelle (Paris; MNHN); Estación Biológica de Doñana (Seville; EBD);

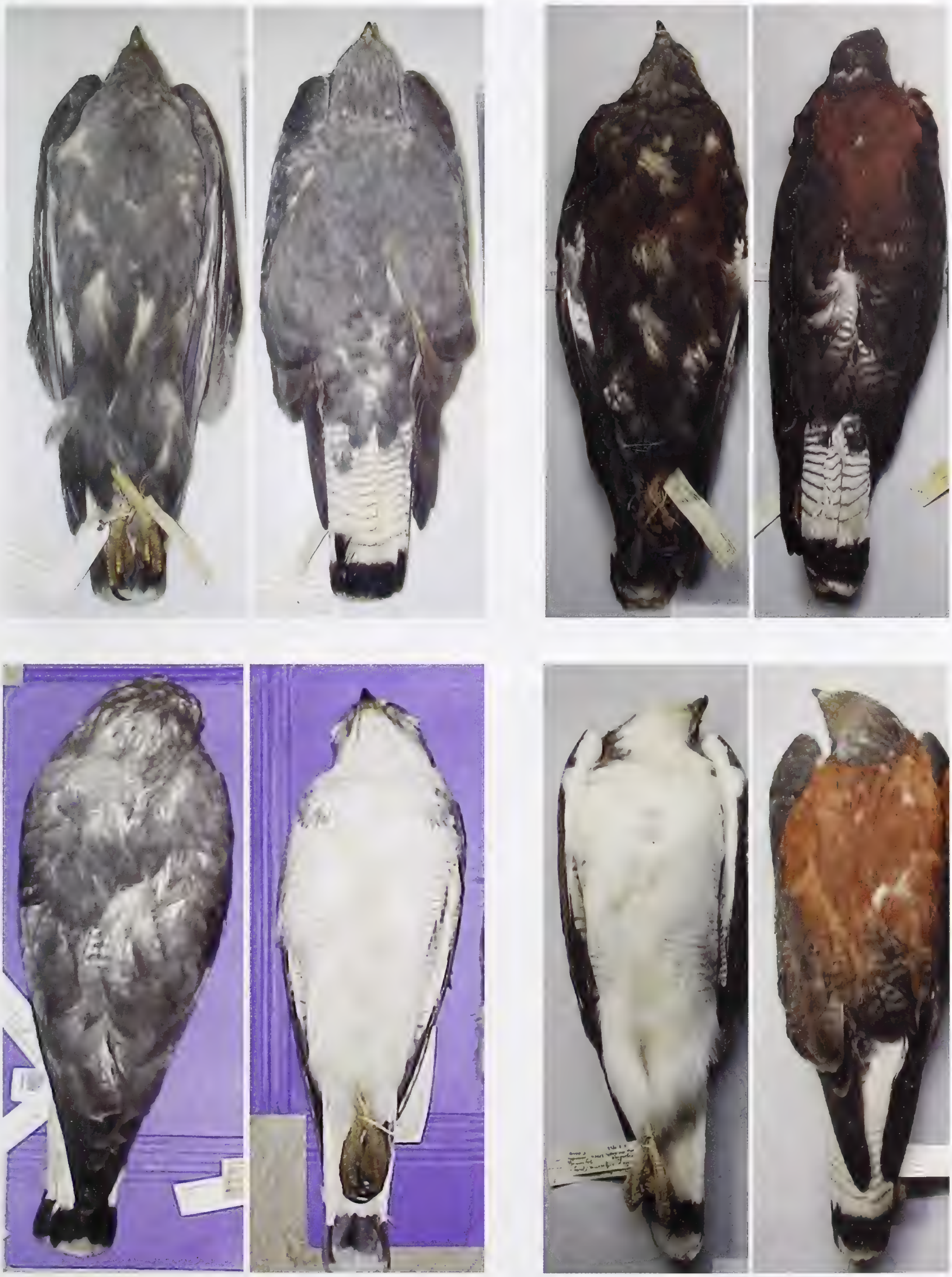

Figure 1. Upper images adult male (BMNH) and female (NHRM) Variable Hawks *Buteo polyosoma* in dark-morph plumage, ventral and dorsal views; below, adult and female pale-morph *B. polyosoma* held at ZMA and NHRM, respectively (J. Cabot)

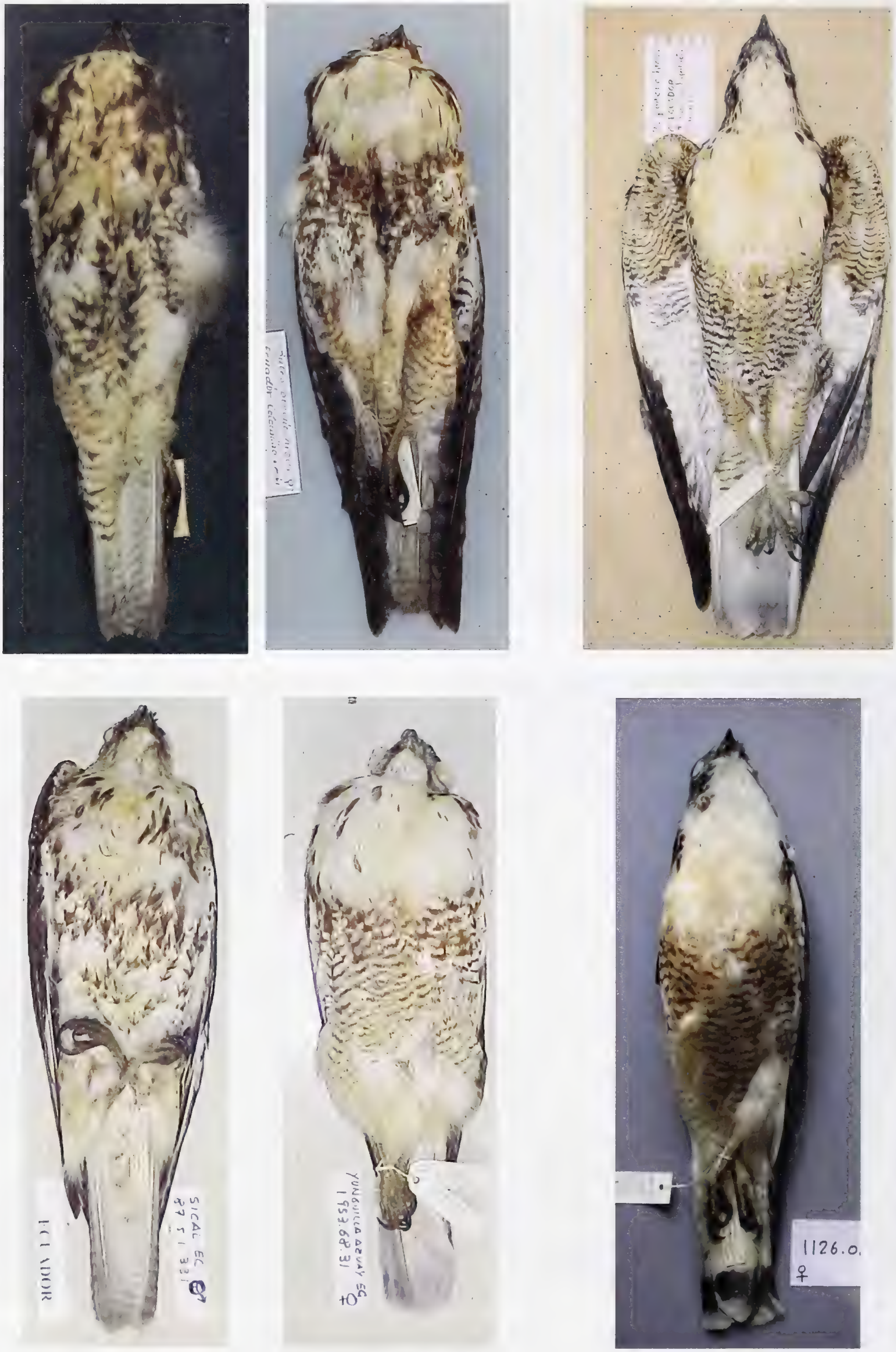
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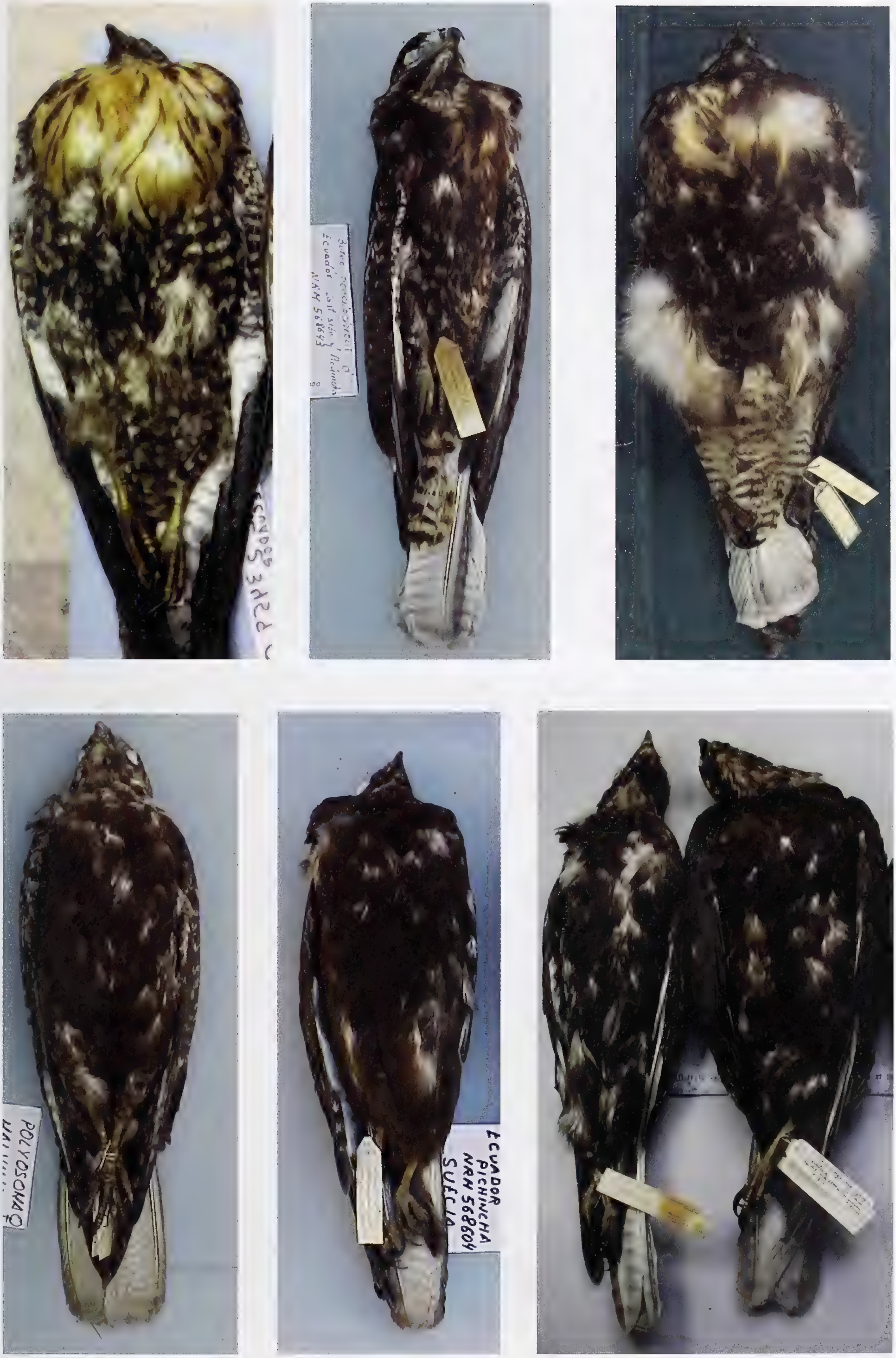
Figure 2. Upper images, pale-morph female Gurney's Hawks *Buteo poecilochrous* in, left to right, their first-, second- and third-calendar years (specimens held at ZMB, NHRM and MCNQ respectively); below, one first-calendar year male (BMNH) and two, second- (BMNH) and third-calendar year (MHNG), pale-morph female Variable Hawks *B. polyosoma*. All specimens of both species are from the Ecuadorian Andes, except one from the Colombian Andes (J. Cabot)


POLYOSOMA ♀
ECUADOR
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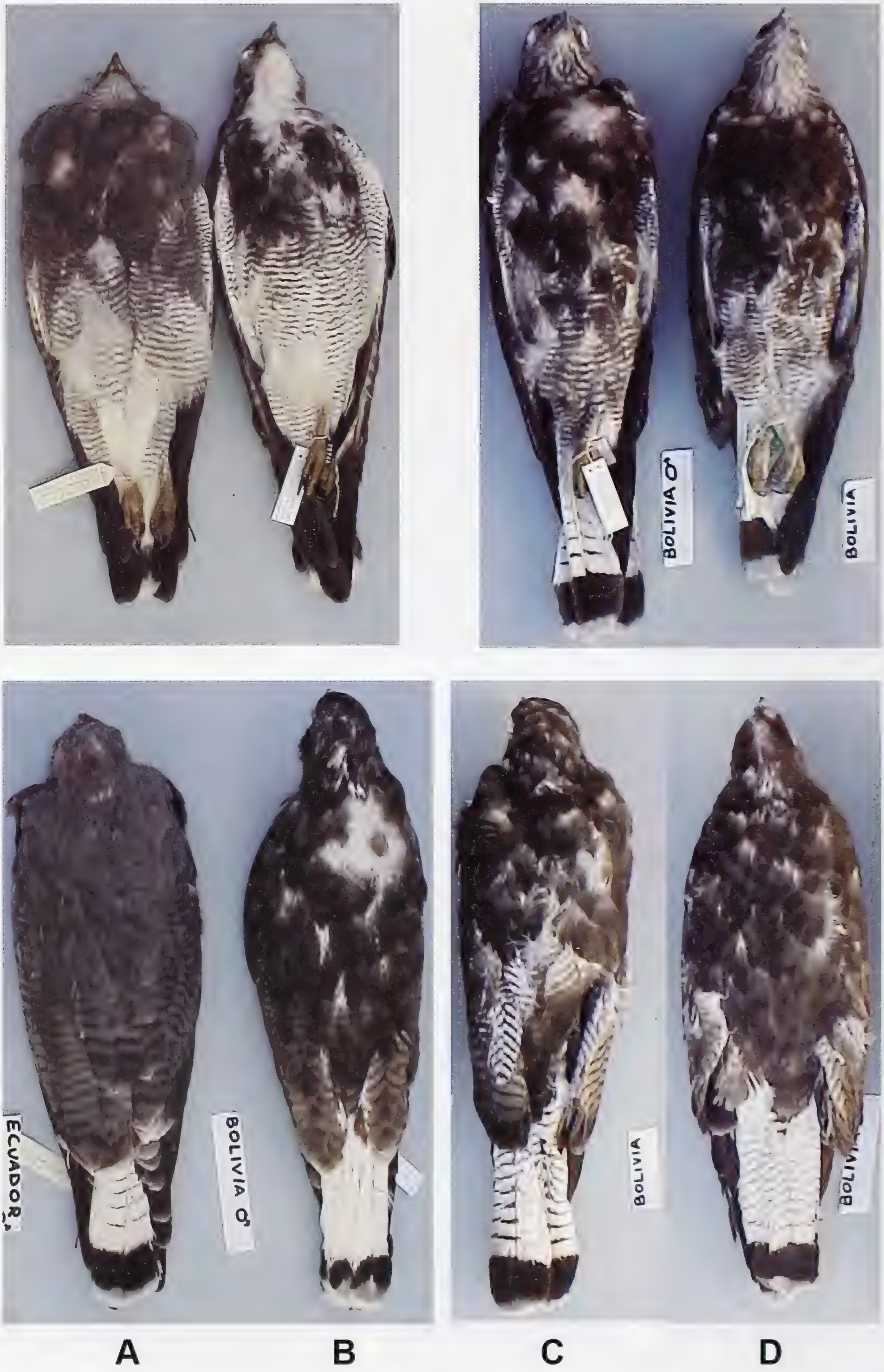
SUECIA

Figure 3. Upper images, dark-morph first-year Gurney's Hawks *B. poecilochrous*, all from Ecuador (from left to right held at ZMUC, NHRM and ZMB); below, dark-morph first-year Variable Hawks *B. polyosoma*, from several countries; the left-hand specimen held at IRSNB, the others at NHRM (J. Cabot)


BOLIVIA ♂
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A
B
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Figure 4. Dark-morph adult male Gurney's Hawks *Buteo poecilochrous*: (a) nominate subspecies from Ecuador (NHRM); (b–d) subspecies *fjeldsai* from Bolivia (EBD), holotype and two paratypes, respectively (J. Cabot)

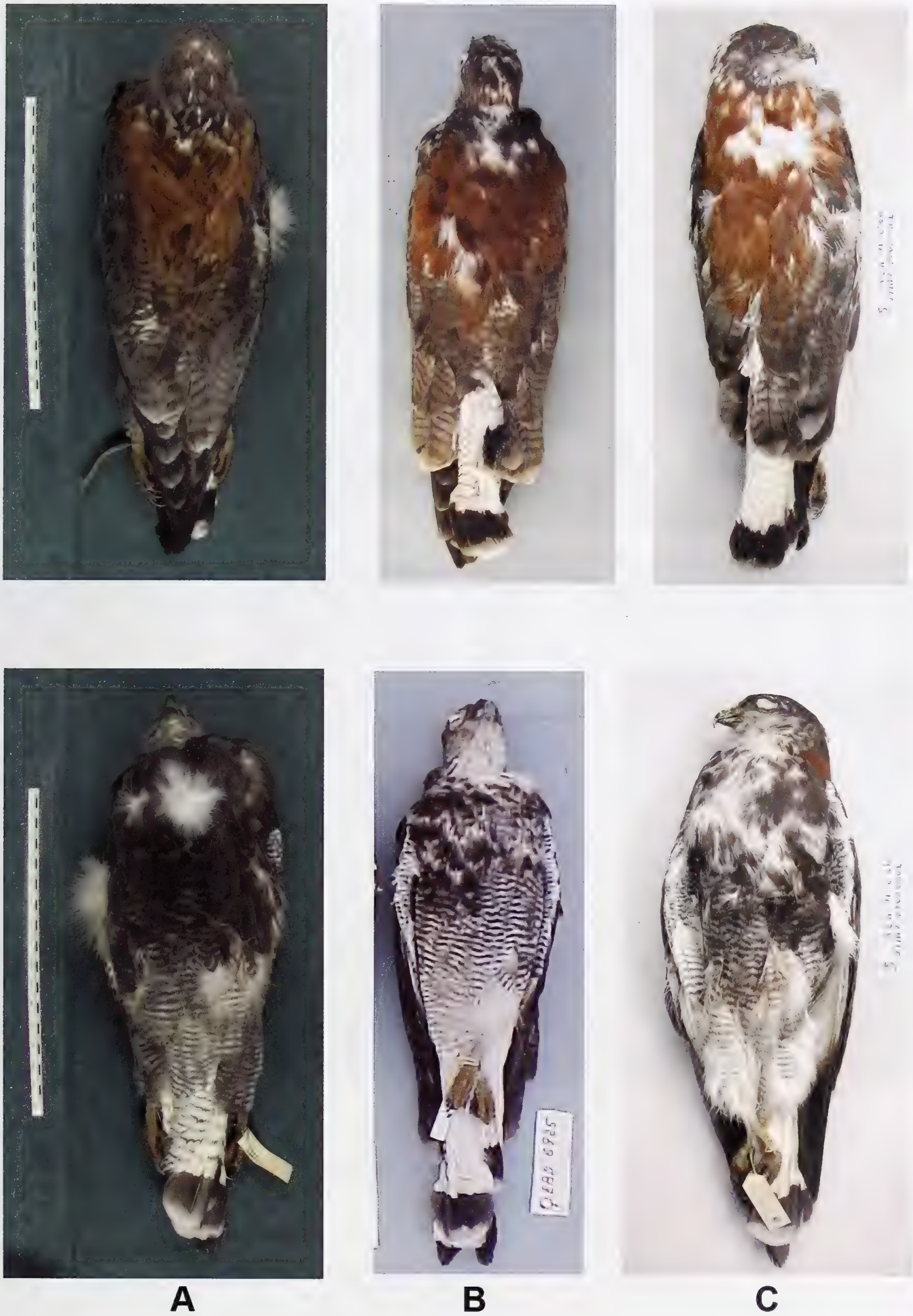

Figure 5. Dark-morph adult female Gurney's Hawks *Buteo poecilochrous*: (a) nominate subspecies from Ecuador (ZMB); (b and c) subspecies *fjeldsai* from Bolivia (EBD) and Chile (BMNH), respectively. Specimen (c) has a reddish tinge to the central underparts that is typical of pre-definitive plumage (J. Cabot / (c) © The Natural History Museum, Tring)

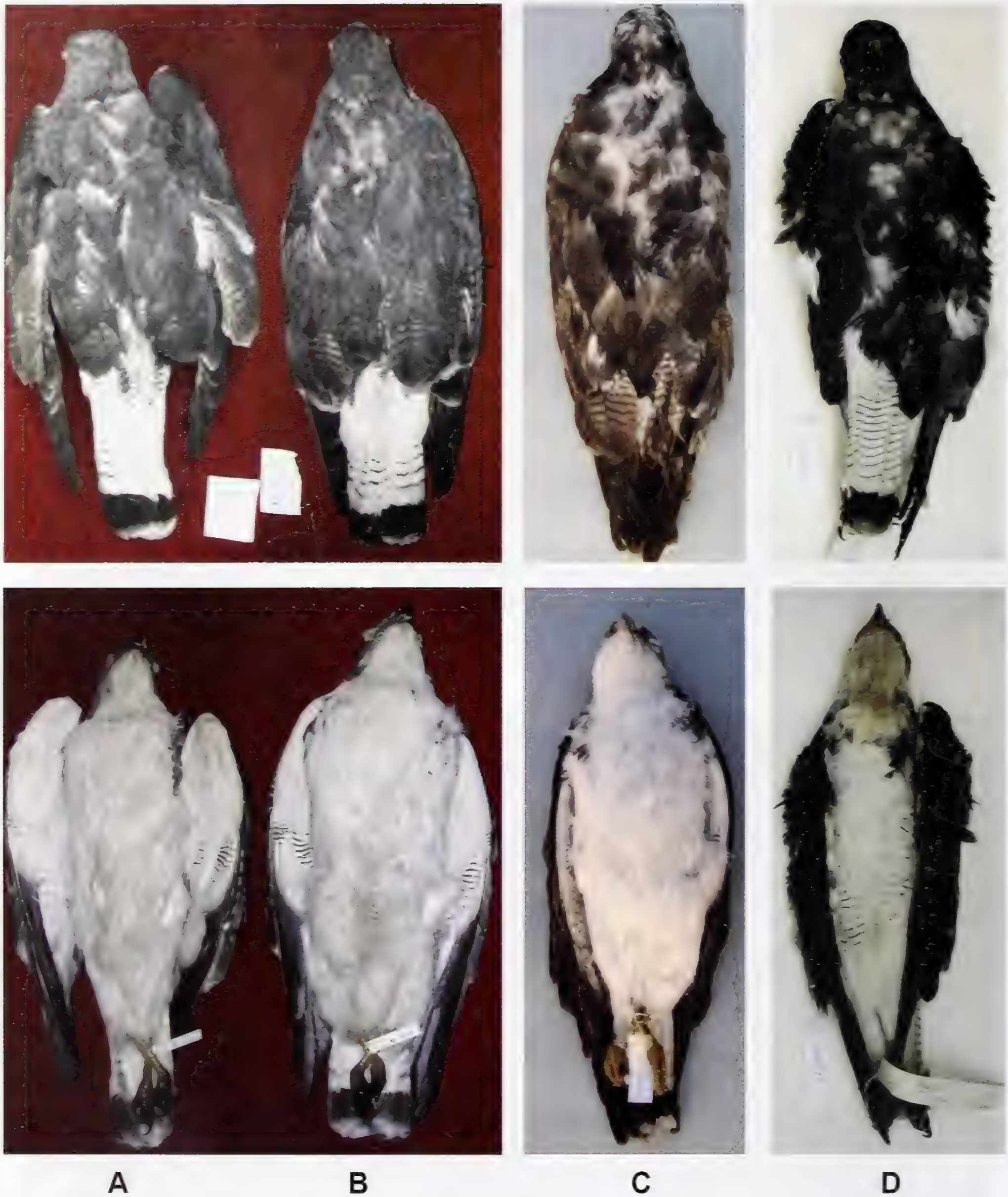

Figure 6. Pale-morph adult male Gurney's Hawks *Buteo poecilochrous*: (a and b) nominate subspecies from Ecuador (Museo de Ciencias Naturales del Instituto 'Mejía', Quito); (c and d) subspecies *fjeldsai* from Bolivia (EBD) and southern Peru (NMNH) (J. Cabot)

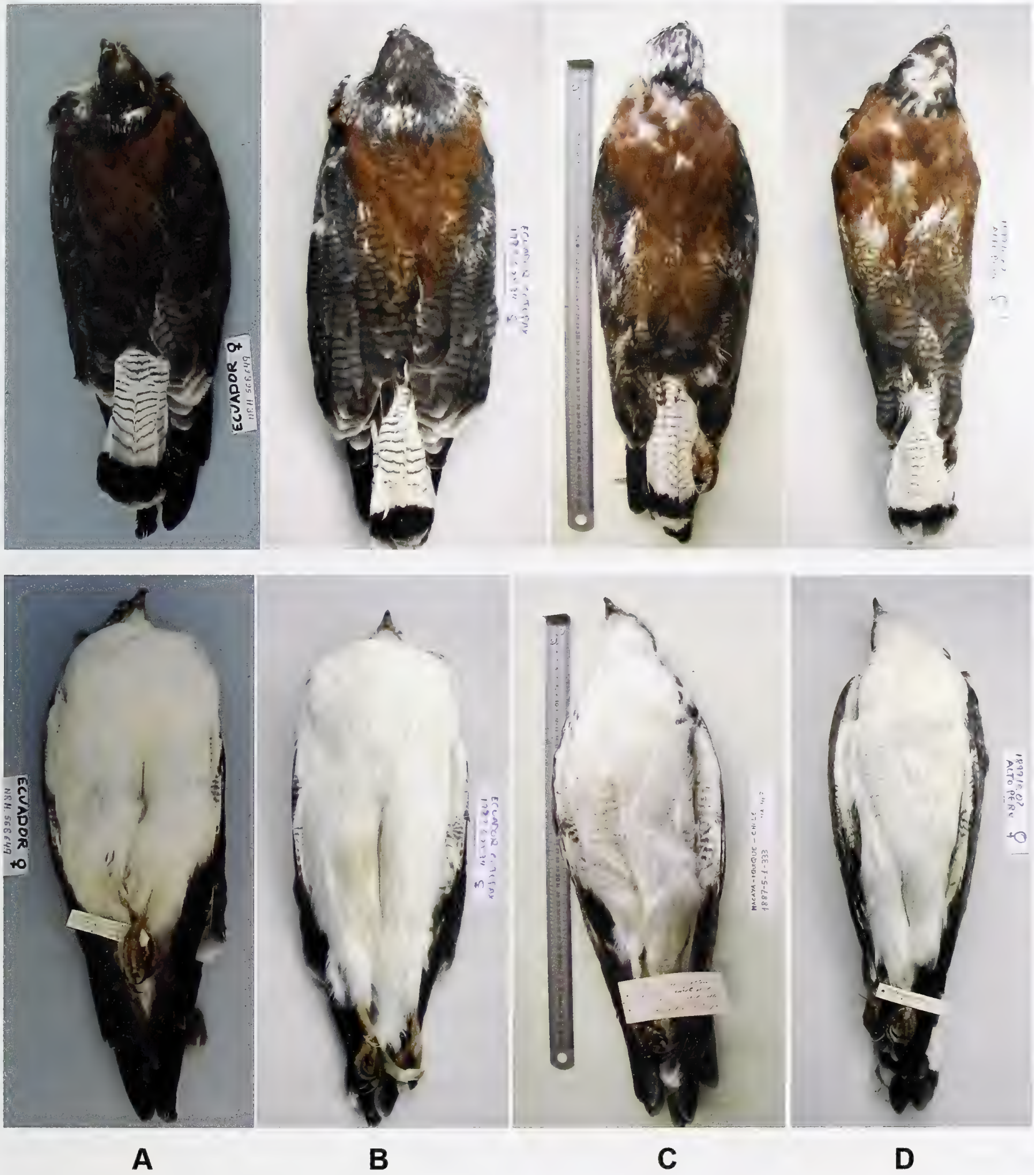

Figure 7. Pale-morph adult female Gurney's Hawks *Buteo poecilochrous*: (a and b) nominate subspecies from Ecuador; (c and d) subspecies *fjeldsai* from Bolivia and Chile (BMNH) (J. Cabot / (c and d) © The Natural History Museum, Tring)

Museo Nacional de Ciencias Naturales (Madrid); Naturhistoriska Riksmuseet (Stockholm; NHRM); Zoological Museum (Copenhagen; ZMUC); and Naturalis (Leiden; RMNH). To complement this, we also examined photographs of specimens from the Museo Nacional de Historia Natural (La Paz), the National Museum of Natural History (Washington DC; NMNH) and Museum für Naturkunde (Berlin; ZMB). During 1996–2002, we monitored annual plumage changes of five Peruvian *B. poecilochrous* that had been held in private zoos and hawking centres since they were juveniles. Field data were collected on an irregular basis in Peru and Bolivia between 1981 and 2004 and in Ecuador from 1986 to 2008. Unsexed specimens were sexed by measurement (Cabot & de Vries 2003) and molecular techniques (Ellegren 1996). Photographs of *B. polyosoma* were also taken of specimens housed at the Zoological Museum, University of Amsterdam (ZMA), Museum d'Histoire Naturelle Ville de Geneve (Geneva; MHNG) and at several of the museums mentioned above.

Because the species possesses two colour morphs and delayed plumage maturation, specimens in definitive plumage were selected as the holotype and paratypes for the new subspecies. Plumage patterns vary with age and sex for up to six years before definitive plumage is attained (Cabot & de Vries 2008), as is also true of Variable Hawk *B. polyosoma* (Pávez 1998, Cabot & de Vries 2004). The holotype of the new subspecies, a dark-phase male, coincides in sex and morph with the holotype of the nominate subspecies (Gurney 1879), whilst the paratypes comprise pale-morph and dark-morph birds of both sexes.

For the morphometric analysis, body measurements were taken from 36 females (two from Colombia, 12 from Ecuador, seven from Peru, 12 from Bolivia, one from Argentina and two from Chile) and 37 males (19 from Ecuador, five from Peru, 11 from Bolivia and two from Chile). The following measurements were taken: culmen from tip to skull; cranial width (post-orbital border); length of the cubito-radius; tarsus; middle and hind toes; outer and hind claws (using callipers, to the nearest 0.01 mm); width of the second (p9) and third (p8) outermost primaries at the base of the notch; wing, alula and tail lengths; the outermost primary (p10) and the outermost secondary were measured at their maximum length from the tip to the skin insertion (flattened against a ruler, to the nearest 0.5 mm).

An analysis of variance was used to evaluate the significance of any differences in the morphometric variables.

Buteo poecilochrous fjeldsai subsp. nov.

Holotype.—Adult male, EBD 7274A, collected 8 June 1984 by J. Cabot at Peñas, prov. Los Andes, dpto. La Paz, Bolivia (16°14'S, 68°30'W; 3,850 m). Habitat: *puna* with grass tussocks and *Lepidophyllum* scrub. Weight 810 g; total length 540 mm; culmen 34 mm; tarsus 89.3 mm; wing 434 mm; tail 221 mm; testes: left 12 × 6 mm, right 10 × 6 mm.

Paratypes.—*Dark-morph males*: EBD 4866A, arroyo Cañuma, prov. Bautista Saavedra, dpto. La Paz, Bolivia, 19 July 1982; high-Andean *puna*, west of the east Andean cordillera, 4,600 m. EBD 6917A, 30 km south of La Paz city, prov. Murillo, dpto. La Paz, Bolivia (16°46'S, 68°10'W), 7 January 1984; *puna* with rolling plains of sparse tussock grass, 3,800 m. EBD 7476A, Sopocachi, prov. Pacajes, dpto. La Paz, Bolivia (15°05'S, 69°06'W), 10 November 1984; semi-arid *puna* with rolling plains and hills of *Lepidophyllum* scrub, and rocky areas with cliffs and small stands of *Polylepis*, 3,700 m (all collected by J. Cabot). MNHN 3024, Checayani, 37 km north of Lake Titicaca, dpto. Puno, Peru (14°48'S, 70°01'W), collected 10 December 1960 by J. Dorst. BMNH 1899.10.3.3, Peru, *c*.4,900–5,500 m, collected by G. P. Ashmore. BMNH 1902.3.13.1601, Choquecamate, dpto. Cochabamba, Bolivia (16°50'S, 65°70'W: given by collector), collected 29 July 1901 by P. O. Simons; 4,000 m.

Dark-morph females: EBD 6925, 40 km north-east of La Paz, near turn-off to Pucarani, prov. Murillo, dpto. La Paz, Bolivia (16°22′S, 68°30′W), collected 14 January 1984 by J. Cabot; *puna* with rolling plains of sparse tussock grass, 3,800 m; ovaries 21 × 12 mm; weight 1.2 kg; stomach contents a bird (*Turdus chiguanco*?) and beetles. MNHNP 3025, Azángaro, dpto. Puno, Peru (18°47′S, 68°15′W), collected 10 December 1960 by J. Dorst. BMNH 1892.2.10.438, Lalcalhuay, prov. Tarapacá, Chile, collected 27 January 1886 by C. Rahmer (*cf.* Paynter 1988). BMNH 1904.7.9.3, either Rinconada, near Laguna de Pozuelos, or elsewhere in the dpto. of Rinconada, prov. Jujuy, Argentina (22°26′S, 66°09′W), collected 4 June 1897 by G. F. Gerling; *puna*, 3,870 m.

Pale-morph males: EBD 5700A, 10 km north of Sevaruyo, prov. Avaroa, dpto. Oruro, Bolivia (19°16′S, 66°50′W), 6 November 1982; arid *puna* with thola scrub, 3,700 m. EBD 6917A, Huachacalla, prov. Litoral, dpto. Oruro, Bolivia (18°47′S, 68°15′W), 12 August 1984; *puna* desert with sparse grass tussocks and thola scrub, 3,700 m (both collected by J. Cabot). BMNH 1902.3.13.1598, Choquecamate dpto. Cochabamba, Bolivia (16°50′S, 65°70′W: given by collector), collected 30 July 1901 by P. O. Simons; 4,000 m (wrongly sexed as female).

Pale-morph females: BMNH 1873.7.4.5, Ccachupata (= Cachupata: Stephens & Traylor 1983), dpto. Cuzco, Peru (13°39′W, 71°52′W), collected 14 November 1871 by H. Whitely. BMNH 1899.10.3.2, Alto Perú (= Bolivia), collected by C. P. Ashmore; 3,000–5,400 m. BMNH 1887.5.1.333, Macaya, Iquique, Chile (20°07′S, 69°11′S), collected by H. Rowland (*cf.* Paynter 1988).

Diagnosis.—*Buteo poecilochrous fjeldsai* differs from nominate *B. poecilochrous* as follows. (1) Darker overall, from steel grey to slate-grey, unlike nominate, whose plumage varies from pale grey to mid grey. (2) Upperparts more uniform and blackish barring less obvious. Barring covers basal half of primaries, secondaries and, sometimes, median and greater wing-coverts, whereas in *B. p. poecilochrous* the barring covers only the lesser and median wing-coverts. (3) Inner secondaries and primaries have grey borders to their tips, whereas in *B. p. poecilochrous* the secondaries are broadly fringed white and the inner primaries have white tips. The white fringes are especially wide on the northernmost bird we examined (Túquerres, Colombia: ICN 8724). (4) Barring on uppertail- and undertail-coverts fainter and finer than in *B. p. poecilochrous*, as are the transverse tail bars above the black subterminal band. Females of the new subspecies possess a larger dorsal patch, extending from the mantle to the middle scapulars, with some red on the lower scapulars, whereas in *B. p. poecilochrous* it is restricted to the mantle and upper scapulars (Figs. 1–3); individual variation does exist, however. Plumage changes with age, and females in their third to fifth calendar-years may be very reddish, with an extensive dorsal patch, and reddish feathers elsewhere (rump, back, wing-coverts, flanks, and middle and lower underparts in dark morphs) that they will lose by their sixth year (Cabot & de Vries 2008).

Dark morphs of both subspecies have barred underparts with similar patterns. *B. p. fjeldsai* has a white throat with blackish streaks, foreneck and breast steel grey to slate-grey, the feathers broadly white-edged and intermixed with pure white feathers. The rest of the underparts are strongly barred steel grey to slate-grey and white, except the undertail-coverts, which are white with slight dark vermiculations. *B. p. poecilochrous* has mid grey and whitish-grey bars, the pale throat patch is smaller and it has fewer pale marks in the bib. Some *B. p. poecilochrous* have a uniform grey throat to chest, which is rare in *B. p. fjeldsai*, especially in its southernmost range. Males with apparently uniform plumage and little barring on the thighs and rear underparts are lead grey to steel grey, whereas in *B. p. poecilochrous* they are paler ash-coloured. Pale birds have obvious dark transverse lines on the white chest, belly and thighs; pale *B. p. poecilochrous* has fewer marking on the underparts, and some are pure white below. First- and second-years have brown upperparts with ginger-red or rusty-red markings, whereas younger *B. p. poecilochrous* are darker brown with creamy or ochre markings.

Description of the holotype.—Narrow line on forehead and pre-ocular region white with black filiform feathers; upperparts including head- and neck-sides slate-grey with black striations on feather shafts, and vague ash-coloured fringes. Nape feathers white basally, with small black spots at tips contrasting visibly; mantle uniform, with some feathers slightly tinged at bases with reddish; scapulars slate-grey with paler centres and darker edges, some finely edged brown-ochre; lower scapulars slate-grey with wavy blackish barring and brown fringes, some faintly tinged reddish. Lesser wing-coverts uniform and blacker; median and greater coverts paler with brown sheen and dark barring; primaries and secondaries slate-grey with brown tinge, dark barring and paler tips; inner primaries and secondaries edged white at tips. Back dark slate-grey with lead grey markings; upper rump grey with white-edged feathers, lower rump with wide-spaced, fine grey barring; uppertail-coverts white with sparse, wavy black-brown lines; tail white with eight irregular wavy black transverse bars, broad subterminal black band (*c*.20 mm) with proximal narrow pale grey band and, distally, white edging. Chin and throat white, with black filiform feathers on former and striations on latter comprising dark shafts and narrow black markings on sides that become larger and denser on upper neck; obvious blackish slate-grey chest-band, darker than back, with some feathers variably fringed or tipped white-grey mixed with some white feathers; mid and lower underparts, flanks, belly and thighs white, with well-spaced black barring becoming finer and browner rearwards; white undertail-coverts. Underwing-coverts and axillaries white with black barring. Inner margin of primaries dirty white at base, with barring and brown-grey markings becoming black-brown towards tip; some have white tips, whilst others may lose these through abrasion. Soft parts: brown irides; bluish-grey bill with blackish tip; yellow cere; yellow legs with black claws.

Description of the paratypes.—Dark-morph males have two different definitive plumages. The first is dark grey to slate-grey with white throat and dark barring; underparts white with dark barring, as holotype. Examples include EBD 7476A, which is darker than holotype, without white on forehead, generally less white on underparts, and bolder barring. Throat more heavily streaked; foreneck and neck-sides to lower breast dark slate-grey, some feathers on lower chest have whitish edges; rest of plumage as holotype, but has bolder markings and coarser dark barring; tail has ten, bolder transverse bars and broader subterminal black band (45 mm). EBD 4866A: like previous birds, but dark plumage black-brown rather than dark slate-grey, with narrower tail-band (35 mm). BMNH 1899.10.3.3 and MNHN 3024 have same pattern, with paler dark parts (dull steel grey, not blackish or brownish slate-grey). Birds of the second type appear uniform lead grey, paler than those described above, with thin, sparse barring restricted essentially to the sides and rear underparts. Examples include BMNH 1902.3.13.1601 and EBD 6917A, which are uniform grey, with few white marks limited to fine white barring on lower chest, thighs and belly; lesser and median underwing-coverts uniform grey or with slight white barring, unlike greater coverts, which are densely barred white and grey; upperside (wing and tail) like holotype.

Dark-morph females are similar to holotype, but have brick-red dorsal patch and are somewhat more boldly barred than males. Examples include EBD 6925, with cheeks and ear-coverts finely streaked grey and white; brick-red mantle with dark streaks on shafts;

some partially grey feathers on sides of mantle and lower dorsal patch. Upper and middle scapulars partially reddish; lesser coverts with whitish edges; median and greater wing-coverts, secondaries and inner primaries grey, whilst outer primaries have bluish-silvery bases, all with contrasting black barring; tail dirty white, outer feathers with greyish margins at tips, and 11 irregular blackish bars. White throat heavily streaked black; grey chest-band with broad whitish-edged feathers; rest of underparts more boldly barred, especially flanks. BMNH 1892.2.10.438 is more white below; chin dark-streaked and central chest grey with white feathers; belly has white and grey barring, with some retained reddish-brown feathers on rear underparts and wing-coverts from previous plumages; extensive reddish dorsal patch on mantle and scapulars. BMNH 1904.7.9.3 has more extensive dorsal patch, from hindneck to scapulars; underparts with more grey and less white; throat with more dark streaking, bib more uniform grey with white-edged feathers and a few white feathers at sides; rest of underparts, flanks and thighs more boldly barred black than previous bird. MNHN 3025 has recently acquired definitive plumage similar to previous birds, but much more reddish with extensive dorsal patch reaching tertials; reddish feathers in wing-coverts and on central underparts retained from previous plumage.

Pale-morph males have steel grey back with pale ash-coloured sheen; underparts (including cheeks) pure white or with fine variable barring over chest, flanks, thighs and underwing-coverts; tail has irregular transverse bars above tail-band that are finer than in previous plumages. BMNH 1902.3.13.1598 has fine dark barring on chest, flanks and thighs. EBD 5700 similar but has vague wavy transverse bars over chest, belly and thighs. EBD 6917 has white middle chest, belly, flanks, uppertail-coverts and median and lesser underwing-coverts, all with fine dark barring.

Pale-morph females have upperparts similar to dark-morph females, whilst the underparts recall those of pale-morph males, with a few partly red feathers in the rump (BMNH 1873.7.4.5) or median and lesser wing-coverts (BMNH 1887.5.1.333), or in both (BMNH 1899.10.3.2).

Geographical variation.—Birds from Peru are paler and more steel grey, whereas those from Bolivia, Argentina and Chile are darker and more slate-grey. Dark specimens from the south are white below, with streaking on the throat, a broad chest-band and blackish-barred rear underparts, which overall afford a very contrasting pattern.

Age variation.—Old birds in definitive plumage have purer grey and black tones, with lesser wing-coverts white-edged and with white scaling on the wing edge (pers. obs. in captive birds). In contrast, birds in recently acquired definitive plumage have a brownish cast to the grey parts. In both morphs larger areas of purer white appear with age and there is a gradual loss of darker areas of plumage. In the oldest dark-morph birds, the white throat and the underparts barring restrict the dark chest-band, in which the number of white feathers increases. The underparts of old females possess the same pattern as in males of the same morph, whilst the reddish dorsal patch contracts and is limited to the mantle. In addition, both the reddish tones on the underparts (only in the dark morph) and the reddish feathers in the upperwing-coverts and rump (both morphs), which are typical of females in pre-definitive or recently acquired definitive plumage, disappear.

Morph variation.—Dark-morph males have darker upperparts than pale morphs. Nevertheless, females of both morphs possess similar dorsal coloration. Dark-morph males possess two definitive body patterns: a) dark (slate-grey or blackish), with a white throat, dark grey chest and white underparts with black barring, which may vary individually in extent and intensity (Fig. 4); b) uniform steel or lead-grey, less black with smaller areas of white plumage; they lack contrast on the throat and have faint white barring only on the belly and thighs. Dark females have the underparts as the holotype (Fig. 5). No females with uniform grey underparts (as in dark males) have been observed. Pale-morph individuals (both sexes) show little variation in the intensity and depth of the wavy barring on the underparts and underwing-coverts (Figs. 6–7).

Measurements.—*B. p. fjeldsai* is slightly smaller than *B. p. poecilochrous* (Table 1), except that the alula and outermost primary are longer, and the primary tips narrower.

TABLE 1

Mean and typical deviations of body measurements (in mm) for *B. p. poecilochrous* and *B. p. fjeldsai* (* = $p< 0.001$, ANOVA).

	B. p. poecilochrous ♂			*B. p. fjeldsai* ♂			*B. p. poecilochrous* ♀			*B. p. fjeldsai* ♀		
	n	x	s.d.	*n*	x	s.d.	*n*	x	s.d.	*n*	x	s.d.
Weight (g)	0	-	-	8	**840**	76.7	1	**1,300**	0	13	**1,170**	69.5
Culmen*	13	**36.8**	1.1	15	**34.6**	1.6	15	**40.1**	1.2	14	**38.4**	1.3
Cranial width	7	**49.8**	2.3	8	**48.3**	1.3	6	**50.7**	2.1	10	**49.7**	1.4
Tarsus*	12	**96.1**	3.7	17	**91.8**	3.5	14	**100.1**	5.1	19	**96.0**	4.4
Toe 2*	12	**35.1**	2.4	13	**33.1**	1.4	11	**38.8**	2.8	13	**36.1**	1.3
Toe 4*	11	**24.9**	1.5	13	**23.4**	1.4	11	**27.4**	2.8	14	**25.2**	1.3
Outer claw*	11	**24.9**	1.1	13	**24.6**	1.3	12	**27.9**	1.4	13	**27.7**	1.2
Inner claw*	11	**26.0**	1.1	12	**24.5**	1.3	12	**29.2**	1.2	14	**28.0**	1.5
Cubito-radius	16	**146.7**	4.9	13	**135.0**	3.6	6	**151.4**	2.5	16	**146.7**	5.0
Wing*	20	**434.3**	10.2	17	**423.7**	10.1	15	**469.1**	10.3	19	**464.3**	8.6
Alula*	12	**116.7**	6.9	12	**118.4**	5.6	13	**124.0**	7.9	17	**126.3**	5.1
P10 length*	11	**198.9**	11.1	13	**208.0**	11.5	13	**215.5**	7	16	**220.4**	6.4
Tail *	12	**220.9**	19.3	14	**216.6**	13.6	15	**241.4**	18	17	**233.8**	14.3
Outer secondary*	18	**236.1**	22.0	13	**234.4**	11.0	14	**256.3**	14.6	18	**253.0**	12.4
P10 width*	11	**23.1**	0.8	11	**21.3**	1.4	12	**25.3**	1.4	14	**23.5**	1.34
P9 width*	12	**25.1**	1.1	10	**24.1**	0.6	12	**27.7**	1.2	14	**26.0**	1.57
P8 width*	11	**27.1**	1.8	10	**25.7**	1.3	11	**30.2**	1.1	13	**28.7**	1.7

Distribution.—Northern Peru to north-west Argentina and Chile, where apparently sedentary (Cabot 1988, 1991).

Habitat.—High ridges and *puna* in the Andes, at 3,000–5,000 m to the snowline (Fjeldså 1987, Cabot 1988, 1991). At the southern limit of its range in Calama (Antofagasta), in the Atacama of northern Chile, *B. poecilochrous* has been reported at *c*.2,000 m, an unusually low altitude (Cabot *et al*. submitted), where it hunts over the green belts and cultivation bordering the río Loa.

Breeding.—On escarpments and cliffs, although a pair in dpto. Puno, Peru, bred on a *Puya raimondii* tree, initiating the clutch in April–May (Macedo 1964). In Calama, Chile, three pairs (L. Demetrio pers. comm.) started breeding in September, in the early spring (Demetrio & Torres-Mura 1991). In the same area, Cabot *et al*. (submitted) observed a fledged juvenile as well as recently occupied nests on cliffs beside the río Loa in November. As in *B. p. poecilochrous* (Solís & Black 1985, Coello 1997), the newly described subspecies breeds in solitary pairs (Macedo 1964), but sometimes with more than one male in a given territory (Cabot *et al*. submitted).

***Etymology*.**—The subspecific epithet honours Jon Fjeldså, for his contribution to the conservation of Andean ecosystems and his many contributions to ornithology, and is formulated as a noun in the genitive case, following the relevant Articles of the Code (ICZN 1999; Arts. 32.5.2.1 and Art. 31.1.2).

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The avifauna of Kofiau Island, Indonesia

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SUMMARY.—Kofiau is an island of 144 km^2 lying among the Western Papuan Islands 30 km west of the New Guinea continental shelf. Although it supports two endemic allospecies and three subspecies of birds discovered during brief earlier surveys, it has remained ornithologically the most under-surveyed significant island of the Papuan Region. In three visits we increased Kofiau's known avifauna from 29 to 78 species. Its avifaunal species composition is typical of the Papuan Region's oceanic islands, in lacking bird species that do not fly across water and hence are confined to New Guinea and the larger continental islands of the New Guinea shelf. The avifauna is convergently similar to that of Bismarck islands east of New Guinea, similarly founded by over-water colonisation. The Western Papuan Islands support ten species of avian supertramps, i.e. species characteristic of species-poor small and / or remote islands. More colonists reached Kofiau from New Guinea than from Wallacea. We discuss the relationship of Kofiau to Lydekker's Line, the eastern equivalent of the much more famous Wallace's Line that forms the western boundary of Wallacea. We report the first field observations of Kofiau's five endemics, and of three Kofiau populations constituting first or second records for the Papuan Region.

The year 2009 is being marked by many celebrations to recognise the 150th anniversary of publication of Darwin's *On the origin of species* in 1859. As the first detailed exposition of evolution and natural selection, Darwin's book founded the science of evolutionary biology and is widely considered the greatest single advance in the history of biology. Few celebrations recognise Alfred Russel Wallace, who in the previous year had independently conceived and published simultaneously with Darwin a brief account of evolution and natural selection (Wallace 1858). Wallace's two books *The geographic distribution of animals* (1876) and *Island life* (1880) founded the science of biogeography.

Our paper contributes to honouring Wallace through an account of the birds of Kofiau Island, lying in what Wallace termed the Malay Archipelago (the island zone between the South-East Asian mainland and New Guinea). The eight years that Wallace spent collecting in the archipelago played a far larger role in forming his ideas than did Darwin's brief visit to the Galápagos archipelago in shaping Darwin's. Wallace termed his years in the Malay Archipelago the 'central and controlling incident' of his life. Wallace's name is associated with the two most striking biogeographic features of the archipelago, termed Wallace's Line and Wallacea; the former is the most famous single feature of world biogeography.

Wallace attempted to land on Kofiau from a sailing canoe on 21 June 1860, but unfavourable winds drove him past the island (Wallace 1869: 519, where he refers to Kofiau by the name of Poppa). Hence it was reserved for another collector seven years later to bring ornithological fame to Kofiau by discovering there a beautiful endemic species of paradise kingfisher. Subsequent collectors on Kofiau also obtained an endemic species of monarch flycatcher and three endemic bird subspecies. However, those previous ornithological visitors only collected specimens and reported no field observations. As a result, Kofiau has been ornithologically the most under-surveyed significant island of the Papuan Region. Our paper is based on three visits to Kofiau, in 1986, 2002 and 2007. We increased the number of bird species known for Kofiau from 29 to 78 species, and we provide the first field information on Kofiau's five avian endemics and other birds.

As background, it is useful to remind ourselves of the differences between three biogeographic lines: Wallace's Line, Lydekker's Line and Weber's Line (see Fig. 1). Wallace's Line was named for Wallace by T. H. Huxley in 1868. To Wallace, it signified both a biogeographic and a geological divide. He noted that it is of biogeographic importance, because the line marks the eastern limit of the rich tropical continental Asian fauna. But Wallace recognised that the line is also geological: it marks the eastern limit of the shallow Asian continental shelf (termed the Sunda Shelf), such that islands west of the line, of which the largest are Bali, Java, Borneo and Sumatra, were (as we now know) part of the Asian mainland during Pleistocene times of low sea level. That second (geological) significance of Wallace's Line explains its first (biogeographic) significance: Asian animals that have difficulty crossing salt water (such as most non-volant mammals except rodents, almost all strictly freshwater fish, and many birds) were able to spread east during the Pleistocene to Bali and Borneo because those islands were then part of the Asian mainland, but could not cross beyond the Asian shelf limit across the permanent deep saltwater gap between Bali and Lombok.

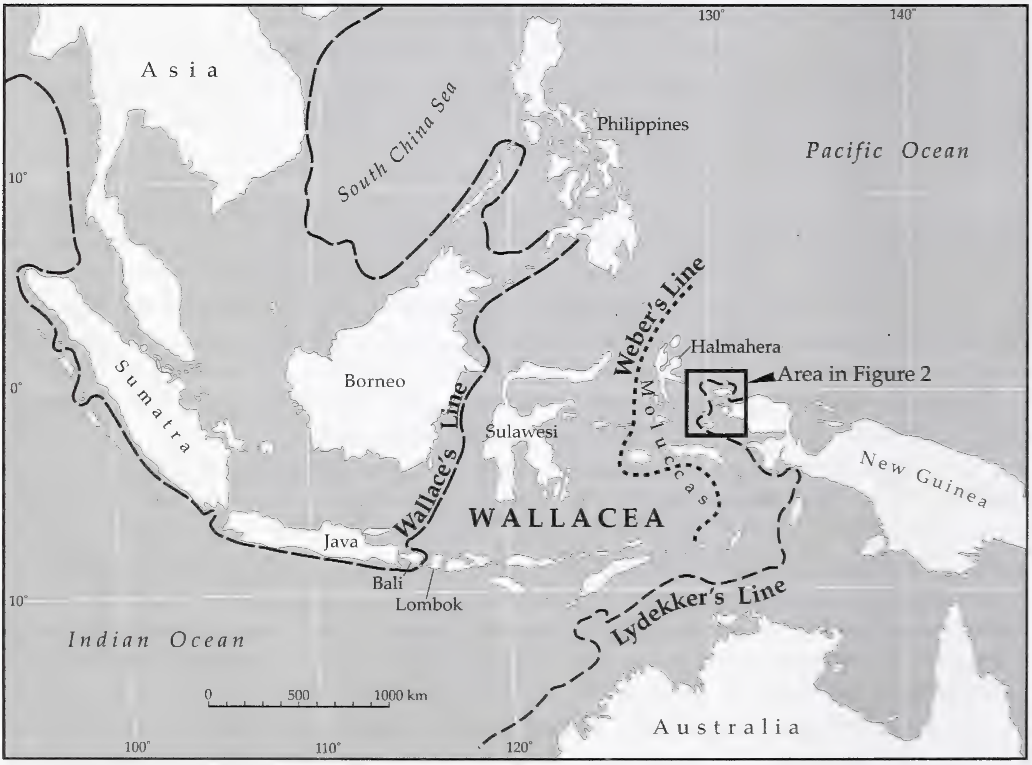
Asia
South China Sea
Philippines
Pacific Ocean
130°
140°
10°
0°
10°
Sumatra
Borneo
Wallace's Line
Sulawesi
Weber's Line
Halmahera
Area in Figure 2
Moluccas
New Guinea
WALLACEA
Java
Bali
Lombok
Lydekker's Line
Indian Ocean
0
500
1000 km
Australia
100°
110°
120°

Figure 1. The tropical island region that Wallace termed the Malay Archipelago, extending from the South-East Asian continent in the west to New Guinea and Australia in the east. The dashed lines indicate the edges of the Asian and the New Guinea / Australian continental shelves at the 200-m ocean depth contours. Hence the dashed lines also indicate the margins of the Asian and the combined New Guinea / Australian continents at Pleistocene times of low sea level, when sea level was 150–200 m below the present. Wallacea is the island region between those shelf limits, consisting of islands with no recent connection to either continent. See text for discussion of Wallace's, Weber's and Lydekker's Lines.

The second line, termed Lydekker's Line, is the eastern equivalent of Wallace's Line. Whereas Wallace's Line marks the eastern limit of the Asian shelf and of the continental Asian fauna, Lydekker's Line forms the western limit of the Australian/New Guinea shelf (termed the Sahul Shelf) and of the continental Australo-Papuan fauna. (Australia and New Guinea were joined in a single continent at Pleistocene times of low sea level.)

Wallace's Line and Lydekker's Line both correspond to real geological features with biogeographic consequences. In contrast, the third line, termed Weber's Line, is defined purely biogeographically and has no geological counterpart. Wallace mistakenly believed that Wallace's Line marked the boundary between the Oriental biogeographic region and the Australian (or Australo-Papuan) biogeographic region. In fact, when subsequent authors calculated the decrease in the proportions of Oriental species and the increase in proportions of Australo-Papuan species as one proceeds east through the Indonesian island chains from Wallace's Line toward Lydekker's Line, it turned out that island faunas remain predominantly Oriental for at least 800 km east of Wallace's Line. Hence modern biogeographers often consider the Oriental Region proper to extend east only to Wallace's Line, the Australo-Papuan region proper to extend west only to Lydekker's Line, and the island zone between those two lines to represent a transition zone termed Wallacea (see Fig. 1). The fauna of Wallacea includes many insular endemics, but Wallacea is poorer in species than either of the two continental regions flanking it, because it consists of so-called oceanic islands that have had no recent connection to either continent and that in consequence have been populated only by species capable of crossing salt water. Weber's line of faunal balance marks the approximate line through Wallacea at which faunas are 50% Oriental and 50% Australian.

This brief account omits many interesting complications that are discussed by Darlington (1957) and Mayr (1976), and some of which we shall consider in this paper. For our purposes here, we merely note at this stage that Kofiau does not lie on the Sahul Shelf but 30 km west of it (Fig. 2), and has had no recent connection to New Guinea. Hence its fauna must have arrived over water.

Description of Kofiau

Kofiau is centred on 01°11′S, 129°50′E, and has an area of 144 km^2 (Fig. 2). The nearest point of the New Guinea mainland is presently 110 km to the east; Misool, a species-rich island lying on the Sahul Shelf and hence supporting much of the New Guinea lowland avifauna, is 58 km to the south. The nearest large island of Wallacea is the Moluccan island of Halmahera 138 km to the west.

Most of Kofiau is flat and low, but there are two small hills, one (Mata Hill) of 288 m near the north-west coast, and the other of 255 m near the west end. A small lake (Lake Enyar Dore) of *c*.10 ha lies 1 km east of Mata Hill. Off the north-west, west and south-west coasts are *c*.20 smaller islets, all within 1–2 km of Kofiau or of each other and virtually constituting extensions of Kofiau. Kofiau's three villages, Tolobi, Dibalal and Deer, all lie on three of those islets off the west and north-west coasts, but their main garden areas lie directly opposite those islets on Kofiau itself.

At the time of our visits, most of Kofiau still supported forests up to 35 m tall. Gardens, coconut plantations and second growth (often with remnant tall trees) occur especially near the villages, along the north-west coast and on the offshore islets. There is much mangrove on western Kofiau and on the west and south-west islets. The eastern half of Kofiau has many exposed coral blocks and is largely unused by people.

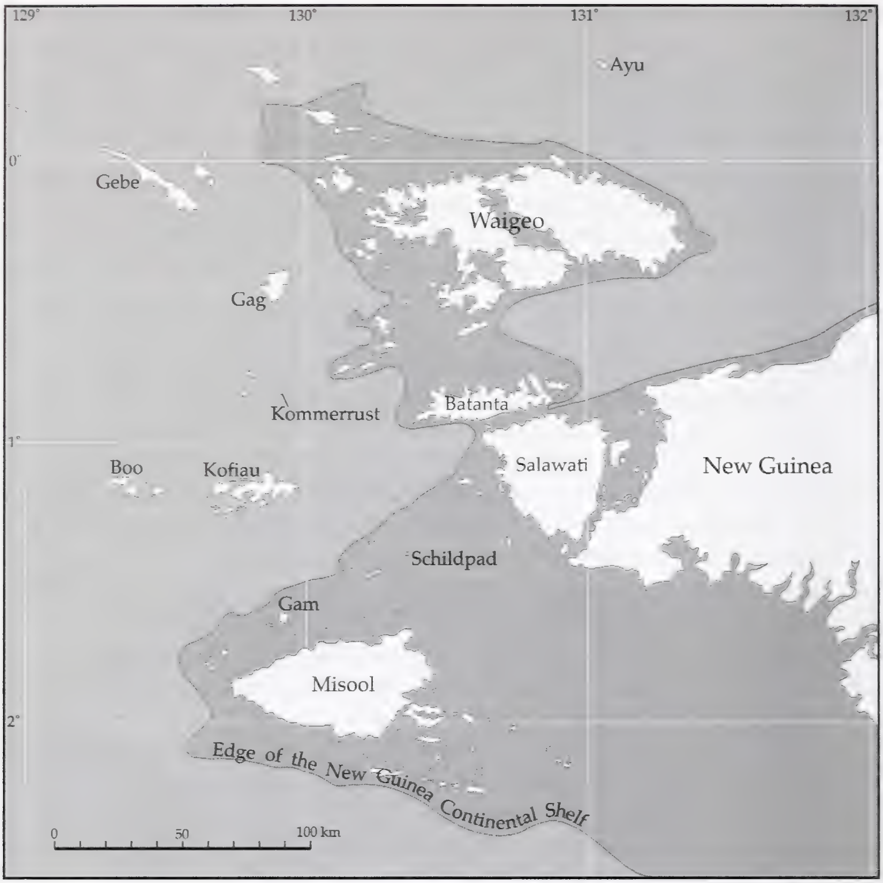

Figure 2. The Western Papuan Islands, with the New Guinea continental shelf lying within the 200-m ocean depth contour denoted in darker grey. Note that Kofiau, Gag and Gebe lie off the shelf and have had no recent land connections to the New Guinea mainland, whereas Salawati, Misool, and possibly Batanta and Waigeo lie on the shelf and were part of New Guinea at Pleistocene times of low sea level.

Surveys of Kofiau

Previous surveys.—Five ornithological collections were made on Kofiau prior to our surveys. H. A. Bernstein visited on an unknown date in 1863–65. The sole evidence of his visit is a specimen of the cuckoo *Cacomantis variolosus* examined by Salvadori (1880–82, vol. 1: 337). David Hokum, an assistant of the collector D. S. Hoedt, visited around 26 July 1867 and obtained five species, including the types of the Kofiau endemics *Tanysiptera ellioti* and *Rhipidura rufiventris vidua*. In a 30-hour visit on 30–31 July 1875, cut short by the deaths of three of his hunters, Odoardo Beccari obtained 40 skins of 18 species (Beccari 1875). Hunters for the trader A. A. Bruijn obtained two species (the same two of which Hokum had collected the types) in August 1875. Finally, Jusup Khakiaj collected 21 species between 25 April and 9 May 1955 (Ripley 1959).

Our surveys.—We carried out three surveys: JD & KDB on 6–8 February 1986, and IM & LW on 10–23 July 2002 and 19–23 April 2007. All three surveys used base camps near Deer village and visited Lake Enyar Dore. The first and third surveys each twice ascended Mata Hill. JD & KDB used a boat to visit all three villages, both the west and east ends of Kofiau, and three of the western islets without villages (Djailolo, Myotkoya and Monkesi). In addition to visual observations, we used tape recorders to capture vocalisations, and later listened to our recordings in order to detect species that might have escaped our notice in the field.

Species recorded for Kofiau

Of the 29 species previously collected on Kofiau, we observed all but two: the wintering Pacific Golden Plover *Pluvialis fulva*, of which Khakiaj collected one specimen; and Island Whistler *Pachycephala phaionota*, a specialist of small islets, of which Khakiaj collected two without specifying whether he took them on Kofiau itself or on one of its fringing islets.

To those 29 previously recorded species, we added 49 new records, bringing Kofiau's presently known avifauna to 78 species. Of them, two are seabirds (species nos. 2 and 26 in Table 1), eight or nine are Palearctic winter visitors (nos. 21–25, 54, 56, 57 and possibly 16), two to five are Australian winter visitors (nos. 49, 51, and possibly 44, 52 and 59), and the remaining 62 are presumably resident land and freshwater species. Among the 62 species, several of which we observed only one or a few individuals could prove to be non-breeding vagrants (e.g., nos. 3–6, 9 and 65), whilst conversely it is possible that records of Channel-billed Cuckoo *Scythrops novaehollandiae* (no. 44) refer to breeders rather than to winter visitors as usually assumed.

What additional species might still be found on Kofiau? One indication is provided by the avifaunas of Gag and Gebe, two islands that resemble Kofiau in being of similar size and lying in deep water off the Sahul Shelf (i.e., beyond Lydekker's Line), at distances of 72 and 108 km respectively north of Kofiau (Fig. 2). The avifauna of Gag, as known from collections by Johnstone (2006) and colleagues in 1997, our observations (JD & KDB) in 1986, and a few specimens collected in the 1860s by Bernstein and by Wallace, comprises 46 resident land and freshwater species, nine seabirds, seven Palearctic and six Australian winter visitors, and two vagrants. The avifauna of Gebe, as known from five collectors (mainly Bernstein) and summarised by Mees (1972), comprises 39 resident land and freshwater species, and four Palearctic and two Australian winter visitors. Most species on both islands—49 of the 70 species of Gag, and 33 of the 45 species of Gebe—have been recorded on Kofiau. Unrecorded from Kofiau are three possible or presumed residents (Beach Kingfisher *Halcyon saurophaga*, Grey Whistler *Pachycephala griseiceps* and White-breasted Woodswallow *Artamus leucorhynchus*) and one winter visitor (Grey-streaked Flycatcher *Muscicapa griseisticta*) of both Gag and Gebe; four possible or presumed residents (Beach Stone-curlew *Esacus magnirostris*, Stephan's Emerald Dove *Chalcophaps stephani*, Collared Kingfisher *Halcyon chloris* and Spot-winged Monarch *Monarcha guttulus*), two presumed vagrants (Cattle Egret *Bubulcus ibis* and Gurney's Eagle *Aquila gurneyi*), four presumed winter visitors (Great Egret *Egretta alba*, Chinese Sparrowhawk *Accipiter soloensis*, Ruddy Turnstone *Arenaria interpres* and Tree Martin *Hirundo nigricans*), and seven marine species (Great Frigatebird *Fregata minor*, Red-footed Booby *Sula sula* and five tern species) of just Gag; and six possible or presumed residents (Black Bittern *Ixobrychus flavicollis*, Moustached Treeswift *Hemiprocne mystacea*, Red-bellied Pitta *Pitta erythrogaster*, Olive Honeyeater *Lichmera argentauris*, Hooded Butcherbird *Cracticus cassicus* and supposedly Glossy-mantled Manucode *Manucodia ater* based on a specimen of dubious provenance) and two winter visitors (Oriental Cuckoo *Cuculus saturatus* and Gray's Grasshopper Warbler *Locustella fasciolata*) of just Gebe. Some of these (e.g., *Ixobrychus flavicollis*) are cryptic and could be resident but overlooked on Kofiau; a few (e.g., *Halcyon chloris* and *Cracticus cassicus*) are so

TABLE 1

Species recorded for Kofiau Island

Scientific nomenclature generally follows Beehler *et al.* (1986) for all species recorded from the Papuan Region, and follows Coates & Bishop (1997) for all species recorded from Wallacea but not from the Papuan Region, with updates to specific names and some taxonomy taken from Gill & Wright (2006). English names are taken in their entirety from Gill & Wright (2006). Subspecific identities of populations for which Kofiau specimens have been collected and studied (e.g., *Megapodius f. freycinet*) are taken from the taxonomic literature, especially Salvadori (1880–82), Mayr (1941) and Ripley (1959). For populations known only from sight records without specimens, we give a subspecies name if the same subspecies occupies the Moluccas to the west and the Western Papuan Islands and western New Guinea to the east, hence presumably also Kofiau (e.g., *Tachybaptus ruficollis tricolor*); or, in a few cases, if we were able to observe subspecific characters in the field (e.g., *Falco m. moluccensis*). Otherwise, we use 'subsp.' to mean that subspecific identity is indeterminate (e.g., *Aviceda subcristata*). Lack of any notation for subspecies means that the species is monotypic (e.g., *Fregata ariel*). * = Kofiau endemic subspecies. ** = Kofiau endemic species.

'Status': res = presumed resident, res? = possibly resident, wva = winter visitor from Australia, wvp = winter visitor from the Palaearctic.

'Habitat': L = lake, C = coastal, S = sea >100 m from the coast, F1 = primary forest, F2 = secondary forest, old gardens and sago swamp, M = mangrove, T = non-forest habitats with trees (gardens, coconut plantations, forest edge), O = open habitats and villages, A = aerial.

'Ab.' (abundance): 4 = Kofiau's nine most abundant species, 3 = common, 2 = in low numbers but encountered repeatedly, 1 = just one or a few records.

'Col./Obs.': Be = Beccari, Bn = Bernstein, Br = Bruijn, D = Diamond & Bishop, H = Hokum, K = Khakiaj, M = Mauro & Wijaya.

'Distr.' (distribution): species present in the Moluccas = M, Kofiau = K, Western Papuan Islands = W (excluding the few species confined there to Kofiau, Gebe and/or Gag), and New Guinea = N. Underlinings denote shared subspecific affinities, as follows. Monotypic species receive no underlining (e.g., species 2, 13 . . . : MKWN, MKW, MK). Species known to be represented by the same subspecies where present in all of our letter-designated regions receive a continuous underlining (e.g., species 1, 3, 15 . . . : MKN, MKWN, MK, KWN, KW, KN). Species of which the Kofiau population is known to belong to the Moluccan subspecies, which is distinct from the Western Papuan Island / New Guinea subspecies, are designated MKWN or MKN (species 28, 58, 77). Conversely, species of which the Kofiau population is known to belong to the Western Papuan Island subspecies or to the subspecies shared by the Western Papuan Islands and New Guinea, distinct from the Moluccan population, are designated MKWN, MKW (species 19, 27, 31 . . .). Finally, species for which the subspecific affinity of the Kofiau population is unknown have no underlining beneath the letter K, and either a single line beneath the letters M, W and N if those populations belong to the same subspecies (e.g., species 16, 36, 40, 45: MKN, KWN, MKW, MKWN), or single and double underlinings to distinguish different subspecies for the populations M, W and N (e.g., species 8, 34, 62: MKWN, MKW) For the three endemic subspecies of Kofiau (species 61, 63, 70), the letter K is not underlined, and different subspecific affinities of the other populations are indicated by single and double underlinings (e.g., KWN, MKWN).

#	English name	Scientific name			Status	Habitat	Ab.	Col./Obs.	Distri.
1	Little Grebe	*Tachybaptus*	*ruficollis*	*tricolor*	res	L	2	D, M	MKN
2	Lesser Frigatebird	*Fregata*	*ariel*		res	S	2	D, M	MKWN
3	Little Pied Cormorant	*Phalacrocorax*	*melanoleucos*	*melanoleucos*	res?	C	1	M	MKWN
4	Great-billed Heron	*Ardea*	*sumatrana*	*sumatrana*	res?	C, M	1	D, M	MKWN
5	Yellow-billed Egret	*Egretta*	*intermedia*	*intermedia*	res?	L, C	1	M	MKWN
6	Little Egret	*Egretta*	*garzetta*	*nigripes*	res?	C	1	M	MKWN
7	Pacific Reef Heron	*Egretta*	*sacra*	*sacra*	res	C, M	2	D, M	MKWN
8	Striated Heron	*Ardeola*	*striata*	subsp.	res	M	2	D, K, M	MKWN
9	Rufous Night Heron	*Nycticorax*	*caledonicus*	*hilli*	res?	F2	1	M	MKWN
10	Osprey	*Pandion*	*haliaetus*	*melvillensis*	res	C	2	D, K, M	MKWN
11	Pacific Baza	*Aviceda*	*subcristata*	subsp.	res	T	1	D	MKWN
12	Brahminy Kite	*Haliastur*	*indus*	*girrenera?*	res	T	2	D, M	MKWN
13	White-bellied Sea Eagle	*Haliaeetus*	*leucogaster*		res	C, S	2	D, M	MKWN
14	Grey Goshawk	*Accipiter*	*novaehollandiae*	subsp.	res	T	2	D, M	MKWN
15	Spotted Kestrel	*Falco*	*moluccensis*	*moluccensis*	res	T	1	M	MK
16	Peregrine Falcon	*Falco*	*peregrinus*	subsp.	wvp?	?	1	M	MKN
17	Spotted Whistling Duck	*Dendrocygna*	*guttata*		res	C	1	M	MKWN
18	Raja Shelduck	*Tadorna*	*radjah*		res	L, C	1	D, M	MKWN
19	Dusky Megapode	*Megapodius*	*freycinet*	*freycinet*	res	F1, F2	3	Be, D, K, M	MKW
20	Red-necked Crake	*Rallina*	*tricolor*	*tricolor*	res	F2	3	M	KWN
21	Pacific Golden Plover	*Pluvialis*	*fulva*		wvp	C	1	K	MKWN
22	Whimbrel	*Numenius*	*phaeopus*	*variegatus*	wvp	C, M	1	D	MKWN
23	Grey-tailed Tattler	*Tringa*	*brevipes*		wvp	C	1	M	MKWN

24	Common Sandpiper	*Tringa*	*hypoleucos*		wvp	C	1	D, M	MKWN
25	Red-necked Phalarope	*Phalaropus*	*lobatus*		wvp	S	2	D	MKWN
26	Swift Tern	*Sterna*	*bergii*	*cristata*	res	S	1	D	MKWN
27	Brown Cuckoo-Dove	*Macropygia*	*amboinensis*	*doreya*	res	F1, F2	3	Be, D, K, M	MKWN
28	Common Emerald Dove	*Chalcophaps*	*indica*	*indica*	res	F2	2	Be, D, M	MKN
29	Nicobar Pigeon	*Caloenas*	*nicobarica*	*nicobarica*	res	F1, F2 ?	1	D, H	MKWN
30	White-bibbed Fruit Dove	*Ptilinopus*	*rivoli*	*prasinorrhous*	res	F1, F2, M	3	Be, D, M	MKWN
31	Claret-breasted Fruit Dove	*Ptilinopus*	*viridis*	*pectoralis*	res	F1, F2, M	3	Be, D, M	MKWN
32	Spice Imperial Pigeon	*Ducula*	*myristicivora*	*myristicivora*	res	F1, F2, M	1	D, M	KW
33	Spectacled Imperial Pigeon	*Ducula*	*perspicillata*	subsp.	res	F1, F2, M	4	D, M	MK
34	Violet-necked Lory	*Eos*	*squamata*	subsp.	res	F2, T	4	D, M	MKW
35	Red-flanked Lorikeet	*Charmosyna*	*placentis*	subsp.	res	F2	1	D, M	MKWN
36	Yellow-crested Cockatoo	*Cacatua*	*galerita*	subsp.	res	F1, F2	3	D, M	KWN
37	Yellow-capped Pygmy Parrot	*Micropsitta*	*keiensis*	*chloroxantha*	res	F1, F2	4	Be, D, M	MKWN
38	Double-eyed Fig Parrot	*Cyclopsitta*	*diophthalma*	*diophthalma*	res	F1, F2, M	1	D, H	KWN
39	Red-cheeked Parrot	*Geoffroyus*	*geoffroyi*	*pucherani*	res	F2, T	2	D, H, K, M	MKWN
40	Great-billed Parrot	*Tanygnathus*	*megalorynchos*	subsp.	res	F2	2	D, M	MKW
41	Eclectus Parrot	*Eclectus*	*roratus*	subsp.	res	F1, F2, T	3	D, M	MKWN
42	Brush Cuckoo	*Cacomantis*	*variolosus*	*infaustus*	res	F2	3	Bn, D, K, M	MKWN
43	Little Bronze Cuckoo	*Chrysococcyx*	*minutillus*	subsp.	res	F2	3	D, M	MKWN
44	Channel-billed Cuckoo	*Scythrops*	*novaehollandiae*		wva?	F2	2	D, M	MKWN
45	Large-tailed Nightjar	*Caprimulgus*	*macrurus*	subsp.	res	T	3	M	MKWN
46	Uniform Swiftlet	*Collocalia*	*vanikorensis*	subsp.	res	A	4	D, M	MKWN
47	Glossy Swiftlet	*Collocalia*	*esculenta*	subsp.	res	A	3	D, M	MKWN
48	Kofiau Paradise Kingfisher	*Tanysiptera*	*ellioti***		res	F1, F2	4	Be, Br, D, H, K, M	K
49	Sacred Kingfisher	*Halcyon*	*sancta*	*sancta*	wva	T	3	Be, K, M	MKWN
50	Little Kingfisher	*Alcedo*	*pusilla*	*pusilla*	res	L	1	Be, D	MKWN
51	Rainbow Bee-eater	*Merops*	*ornatus*		wva	T	3	K, M	MKWN
52	Oriental Dollarbird	*Eurystomus*	*orientalis*	subsp.	wva?	T	3	M	MKWN
53	Hooded Pitta	*Pitta*	*sordida*	*novaeguineae*	res	F1, F2	3	Be, D, K, M	KWN
54	Barn Swallow	*Hirundo*	*rustica*	*gutturalis*	wvp	A	3	D, M	MKWN
55	Pacific Swallow	*Hirundo*	*tahitica*	subsp.	res	A	2	M	MKWN
56	Red-rumped Swallow	*Hirundo*	*daurica*	subsp.	wvp	A	2	M	KN
57	Yellow Wagtail	*Motacilla*	*flava*	*simillima*	wvp	O	1	D, M	MKWN
58	White-bellied Cuckooshrike	*Coracina*	*papuensis*	*melanolora*	res	T, M	2	Be, D, K, M	MKWN
59	Common Cicadabird	*Coracina*	*tenuirostris*	*muellerii*	wva?	T	1	Be, M	MKWN
60	Black-browed Triller	*Lalage*	*atrovirens*	subsp.	res	F2, T	3	D, M	KWN
61	Large-billed Gerygone	*Gerygone*	*magnirostris*	*occasa**	res	F1, F2, M	4	D, K, M	KWN
62	Rufous Fantail	*Rhipidura*	*rufifrons*	subsp.	res	F2	1	D	MKWN
63	Northern Fantail	*Rhipidura*	*rufiventris*	*vidua**	res	F1, F2	4	Be, Br, D, H, K, M	MKWN
64	Willie Wagtail	*Rhipidura*	*leucophrys*	*melaleuca*	res	T, M	2	D, M	MKWN
65	Island Monarch	*Monarcha*	*cinerascens*	subsp.	res?	T	1	M	MKWN
66	Kofiau Monarch	*Monarcha*	*julianae***		res	F1, F2	4	Be, D, K, M	K
67	Shining Flycatcher	*Myiagra*	*alecto*	*chalybeocephalus*	res	F2, M, T	3	Be, D, K, M	MKWN
68	Island Whistler	*Pachycephala*	*phaionota*		res	?	1	K	MKW
69	Olive-crowned Flowerpecker	*Dicaeum*	*pectorale*	subsp.	res	F1, F2, M	3	D, M	KWN
70	Black Sunbird	*Nectarinia*	*aspasia*	*mariae**	res	F2	4	Be, D, K, M	MKWN
71	Olive-backed Sunbird	*Nectarinia*	*jugularis*	*frenata*	res	F2, T, M	3	D, K, M	MKWN
72	Papuan Friarbird	*Philemon*	*novaeguineae*	*novaeguineae*	res	F2, T, M	2	Be, D, M	KWN
73	Black-faced Munia	*Lonchura*	*molucca*		res	O	1	M	MK
74	Eurasian Tree Sparrow	*Passer*	*montanus*	*malaccensis*	res	O	2	M	MKWN
75	Moluccan Starling	*Aplonis*	*mysolensis*	subsp.	res	T	1	D	MKW
76	Metallic Starling	*Aplonis*	*metallica*	*metallica*	res	F1, F2, T	3	D, M	MKWN
77	Hair-crested Drongo	*Dicrurus*	*hottentottus*	*atrocaeruleus*	res	F1, F2	2	Be, D, K, M	MKWN
78	Torresian Crow	*Corvus*	*orru*	*orru*	res	T, M	2	D, M	MKWN

common, vocal and conspicuous where present that our failure to observe them on Kofiau probably means that they really are absent; and others (e.g., *Bubulcus ibis* and *Hemiprocne mystacea*) may just have been vagrants on Gag or Gebe and could equally well turn up on Kofiau. Notable and probably real on all three islands is the absence or paucity of honeyeaters, usually common elsewhere in the Papuan region: on Kofiau we, Khakiaj, and Beccari found only Papuan Friarbird *Philemon novaeguineae*; Johnstone, we, Wallace, and Bernstein found no honeyeater on Gag; and the sole honeyeater known from Gebe is the small-island specialist *Lichmera argentauris*, collected there only by Bernstein, possibly as a vagrant.

Continental and oceanic island species on Kofiau

In passing from Java and Bali across Wallace's Line to Lombok, one leaves behind flightless mammals unable to fly, swim or raft across broad water gaps—such as rhinoceroses, tigers, leopards and gibbons. More surprisingly, because most birds can fly, Wallace was struck by the fact that Wallace's Line also serves as a barrier for many families and genera of birds, including pheasants, barbets, trogons, broadbills, leafbirds, and most genera of woodpeckers and babblers. These and many other tropical birds, whilst physically capable of flying across water, are behaviourally very reluctant to do so (Diamond 1981). Hence their insular distributions are restricted to continental islands that had Pleistocene connections to the Asian mainland, and that are sufficiently large to support sizeable populations able to persist in isolation since the end of the Pleistocene.

Corresponding to Wallace's observation that Wallace's Line at the edge of the Sunda Shelf marks the distributional limit for Oriental bird species unwilling or unable to fly across water, Lydekker's Line at the edge of the Sahul shelf marks the distributional limit for New Guinea species similarly unwilling or unable to cross water. Previous studies had identified 134 species of New Guinea lowland birds known from New Guinea's six large continental islands (Aru, Batanta, Misool, Salawati, Waigeo and Yapen) on the Sahul Shelf and connected to New Guinea during the Pleistocene[1], whilst absent from all oceanic islands near New Guinea but beyond the shelf and lacking Pleistocene connections to New Guinea (e.g., Biak, Gebe, Gag, Karkar, Kei, Manam, Misima, New Britain, Numfor and Woodlark) (Diamond 1972a). Those species include all bowerbirds, all New Guinea birds of paradise except *Manucodia* and *Paradisaea*, many genera with three or more New Guinea lowland species (e.g., *Talegalla*, *Chalcopsitta*, *Psittaculirostris*, *Dacelo*, *Sericornis*, *Pitohui* and *Pycnopygius*), plus some of the commonest species of New Guinea lowland forest (e.g., Beautiful Fruit Dove *Ptilinopus pulchellus*, Blue Jewel-babbler *Eupetes caerulescens*, Rusty Mouse Warbler *Crateroscelis murina*, Yellow-bellied Gerygone *Gerygone chrysogaster*, Frilled Monarch *Arses telescopthalmus*, Brown Oriole *Oriolus szalayi*, Green-crowned Longbill *Toxorhamphus novaeguineae* and Long-billed Honeyeater *Melilestes megarhynchus*).

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[1] It is uncertain whether Batanta and Waigeo actually lie on the Sahul Shelf, or on a separate plate that has remained separated from the shelf by up to a few kilometers. The sea between Batanta and Waigeo is so shallow that those islands were undoubtedly connected to each other during the Pleistocene, and similarly Misool and Salawati were undoubtedly connected to each other and to New Guinea. Batanta is today separated from Salawati by the narrow Sagewin Strait, whose deepest portion is slightly more than 200 m deep. If that were also true throughout the Pleistocene, Batanta / Waigeo would have been separate then from Salawati / Misool / New Guinea, because Pleistocene drops in sea level were by slightly less than 200 m. However, in this tectonically active region one cannot be certain that the depth of Sagewin Strait has remained constant. In their proportions of non-water-crossing bird species, the avifaunas of Batanta and Waigeo are similar to those of Misool and Salawati, suggesting that a Pleistocene water gap at the Sagewin Strait, if it persisted at all, was extremely narrow.

This list of 134 lowland species present on one or more of New Guinea's continental islands but absent from all of its oceanic islands was drawn up 37 years ago, at a time when the avifauna of Kofiau was very incompletely known. Now that Kofiau's avifauna is better known, we re-examined it from this perspective. It turns out that all of Kofiau's species are ones already identified as water-crossers because of their presence on other oceanic islands of the New Guinea region.

That is, the avifaunas of New Guinea's oceanic islands, including Kofiau, are all drawn from a subset of the New Guinea avifauna characterised by ability and willingness to colonise across water. That accounts at least in part for the above-mentioned similarities between the avifaunas of Kofiau, Gag and Gebe: that Kofiau's 62 resident land and freshwater species include 85% of Gag's resident species and 77% of Gebe's resident species. One could object that these three islands are within 108 km of each other, and that their avifaunal similarities may thus be partly due to colonisation between these three. Hence a stronger test is provided by comparing Kofiau's avifauna with that of the Bismarck Archipelago (Mayr & Diamond 2001) east of New Guinea, *c.*2,000 km east of Kofiau, and separated from Kofiau by the entire length of New Guinea. There can hardly have been direct colonisations between the Bismarcks and Kofiau. Because the Bismarck Archipelago includes many islands much larger than Kofiau, the Bismarck resident land and freshwater avifauna (151 species) is richer than Kofiau's (62 species), though much poorer than New Guinea's (432 species). (In these calculations we do not separately count different allospecies of the same superspecies: see Mayr & Diamond 2001.) Of Kofiau's 62 species, eight have no access to the Bismarcks because they are confined to western New Guinea and / or Wallacea and absent from the eastern part of New Guinea facing the Bismarcks (species nos. 15, 33, 34, 40, 68 and 73–75 of Table 1). That leaves 54 Kofiau species with access to the Bismarcks, of which 45 (i.e., 85%) actually occur in the Bismarcks, and only nine are absent (species nos. 4, 18, 28, 38, 39, 43, 48, 61 and 66 of Table 1). This similarity between the Kofiau and Bismarck avifaunas, despite their independent origins, mostly from New Guinea, arose convergently because both avifaunas were founded via over-water colonisation by a vagile subset of New Guinea's rich avifauna.

Supertramps

In the Papuan Region and other tropical regions with many islands, some bird and bat species termed supertramps are confined to species-poor, small and / or remote islands and are absent from species-rich, large and / or central islands except as vagrants (Diamond 1972b). These species have especially high over-water colonisation rates, enabling them to maintain populations (through frequent recolonisations) on islets too small to support self-sustaining populations in isolation, and also enabling them to be among the first species to colonise islands defaunated by volcanic eruptions. Supertramp vagrants reach large species-rich islands but are competitively excluded by established species, except as occasional individuals along the coast.

Which species can be considered supertramps in the Western Papuan Islands? Ornithological visits to five isolated islets of <6 km^2 in that region have been reported: Ayu north-east of Waigeo, visited by Khakiaj on 1 September 1955 (Ripley 1959); Gam north of Misool, visited by JD & KDB on 5 February 1986; Kommerrust north of Kofiau, visited by JD & KDB on 8 February 1986; Little Boo west of Kofiau, visited by IM & LW on 23 April 2007; and Schildpad north-east of Misool, visited by Ripley and other members of the Denison-Crockett Expedition on 19–23 October 1937 (Mayr & Meyer de Schauensee 1939) (see Fig. 2). Collectively, these islets support nine species that approximate to the above definition of supertramps (numbers in parentheses indicate on how many of the five islets each species has been recorded): White-bibbed Fruit Dove *Ptilinopus rivoli prasinorrhous* (3), Spice Imperial Pigeon *Ducula myristicivora* (2), Violet-necked Lory *Eos squamata* (5), Rufous Fantail *Rhipidura rufifrons* (2), *Pachycephala phaionota* (3), Lemon-bellied White-eye *Zosterops chloris* (1), *Lichmera argentauris* (3), Varied Honeyeater *Lichenostomus versicolor* (1) and Moluccan Starling *Aplonis mysolensis* (3). (We add the subspecies name to *P. rivoli*, to emphasise that this species includes a race *P. r. bellus* occupying the New Guinea mainland, as well as the supertramp race *P. r. prasinorrhous*). To this list of nine supertramps may be added a tenth, Island Monarch *Monarcha cinerascens*, not recorded on these five islets but apparently collected on islets off north-west Misool by Hoedt, and widespread on islets elsewhere in Wallacea, the Papuan Region and Northern Melanesia.

Of these five small isolated islets surveyed in the Western Papuan Islands, four were visited briefly, for a day or an hour. The only one surveyed more completely is Schildpad, on which Ripley and his team spent five days collecting. Schildpad yielded eight of the ten supertramps (all but *Monarcha cinerascens* and *Zosterops chloris*), and seven of the eight (all except *Eos squamata*) were noted by Ripley as common there or were collected by him as multiple specimens.

As for the occurrence of the supertramps on larger islands, the literature contains records of nine of these ten species (all except *Zosterops chloris*) by 19th-century collectors for all four of the large continental Western Papuan Islands (Batanta, Misool, Salawati and Waigeo, with areas of 453–3,155 km^2). However, in our own surveys of these four islands our only encounters with these putative supertramps other than *Ducula myristicivora* were two records of *Lichenostomus versicolor* and one of *Aplonis mysolensis* from coastal villages of Misool and Waigeo. We suspect that the 19th-century records were mainly based on specimens similarly collected in coastal villages or on offshore islets, where 19th-century collectors made their bases and which they did not distinguish from the four larger islands themselves. A marginal case for inclusion as a supertramp is *Ducula myristicivora*, which we observed only on the coasts of Batanta and Waigeo where its congeners Pinon Imperial Pigeon *D. pinon* and Purple-tailed Imperial Pigeon *D. rufigaster* are abundant inland.

What about supertramp occurrences on Kofiau, Gebe, and Gag, which are intermediate in area (57–144 km^2) between the small islets (<6 km^2) with many supertramps and the large islands (453–3,155 km^2) with few supertramps? The best surveyed of these three intermediate-sized islands is Kofiau, on which seven of the ten supertramps (all except *Lichmera argentauris*, *Lichenostomus versicolor* and *Zosterops chloris*) have been recorded. Of those seven, we found two common (*Ptilinopus rivoli prasinorrhous* and *Eos squamata*), one scarce (*Ducula myristicivora*), and four represented by only one or two specimens, or observed by just one of the seven ornithological visitors to Kofiau. The scantier information for Gebe and Gag yields a similar conclusion, with one interesting difference. On Gebe (to judge from specimens: Mees 1972) and Gag (Johnstone's and our observations), *Ptilinopus rivoli prasinorrhous* and *Eos squamata* are common, as on Kofiau. *Lichmera argentauris* and *Aplonis mysolensis* are known on Gebe only from one and two specimens respectively taken by a single collector. The interesting exception is that *Ducula myristicivora* is common on Gebe and Gag, but scarce on Kofiau. We attribute this difference to the fact that *Ducula myristicivora* faces competition from its abundant and similar-sized congener Spectacled Imperial Pigeon *D. perspicillata* on Kofiau, but from no congener or indeed any other large pigeon on Gebe and Gag.

Biogeographic affinities of the Kofiau avifauna

Of Kofiau's 62 resident land and freshwater bird species, 35 yield no information about biogeographic affinities, because they are widespread in Wallacea (or at least in the Moluccas) as well as on New Guinea, and are either monotypic (four species: nos. 13, 17, 18, 68), or they occur as the same subspecies throughout the Moluccas and western New Guinea or the larger Western Papuan Islands (20 species: nos. 1, 3–7, 9, 10, 12, 29, 30, 40, 42, 45, 50, 64, 71, 74, 76, 78), or else occur in those two areas as different subspecies but the subspecific identity of the Kofiau population is unknown (11 species: nos. 8, 11, 14, 35, 41, 43, 46, 47, 55, 62, 65).

Among the remaining 27 species that do permit conclusions, their directions of colonisation are suggested by several different lines of evidence. Five are Kofiau's endemic species and subspecies, of which two (species nos. 48 and 63) are most similar to their Moluccan relatives, and three (nos. 61, 66, and 70) are most similar to their Papuan relatives. Among ten species widespread in both the Papuan Region and in Wallacea or the Moluccas, occurring as different subspecies in those two regions, and with the Kofiau population subspecifically identified, the Kofiau population belongs to the Papuan race in seven (nos. 19, 27, 31, 37, 39, 53, 67) and to the Wallacean race in three (nos. 28, 58, 77). Seven species (nos. 20, 32, 36, 38, 60, 69, 72) distributed over all or most of New Guinea extend west only to the Western Papuan Islands (including Kofiau), do not reach the Moluccas, hence can only have reached Kofiau from the direction of New Guinea. Conversely, five Wallacean or Moluccan species extend east only to Kofiau (no. 33), Kofiau and Gag (nos. 15, 73) or very sparingly to other Western Papuan Islands (nos. 34 and 75), hence surely or probably reached Kofiau from the direction of the Moluccas.

Thus, among those 27 informative species, 3 + 7 + 7 = 17 probably reached Kofiau from New Guinea, whilst 2 + 3 + 5 = 10 probably arrived from the Moluccas. Our conclusion of a Papuan predominance in the Kofiau avifauna confirms Mayr's (1941) and Ripley's (1959) conclusions deduced at a time when knowledge of Kofiau's avifauna was much less complete. This Papuan predominance is to be expected because New Guinea is much larger and much more species-rich, and slightly closer to Kofiau than are the Moluccas, and because the large Western Papuan island of Misool supporting a large fraction of the New Guinea mainland avifauna is even closer to Kofiau. The Papuan and Moluccan colonists of Kofiau also differ in their spread beyond Kofiau. One-third (six of 17) of the Papuan colonists have spread further west to colonise species-rich habitats of large Moluccan islands, whilst none of the Moluccan colonists spread east to New Guinea or even to the larger Western Papuan Islands.

Wallacea's eastern boundary

Recent biogeographic discussions of the Malay Archipelago are in agreement that Wallacea is basically the archipelago of oceanic islands lying between the continental islands of the Sunda Shelf to west, and the continental islands of the Sahul Shelf to the east (e.g., Mayr 1976: 637–639, Darlington 1976: 462–472, White & Bruce 1986: 10, Coates & Bishop 1997: 9).

Almost no ambiguities arise in defining the western boundary of Wallacea, because the sea gap separating the easternmost large continental islands of the Sunda Shelf (Borneo and Bali) from the westernmost large oceanic islands of Wallacea (Sulawesi and Lombok) contains only a few, tiny, ornithologically insignificant islets. Hence one can straightforwardly take Wallacea's western boundary as the Sunda Shelf's edge (alias Wallace's Line); the geological and biogeographic lines are essentially the same. However, the situation is more complex at Wallacea's eastern boundary, because the sea gap separating the westernmost large Papuan islands of the Sahul Shelf (Misool, Salawati and possibly Batanta and Waigeo) from the easternmost large oceanic islands of Wallacea (Halmahera and Seram) contains three intermediate-sized islands of ornithological significance (Kofiau, Gebe and Gag), all of which support endemic birds, including the two endemic allospecies of Kofiau. Should Wallacea's eastern boundary be drawn east or west of those three islands, so as to place them in Wallacea or in the Papuan Region respectively?

A simple solution consistent with the definition of Wallacea's western boundary would be to take its eastern boundary as the Sahul Shelf's edge (Lydekker's Line), thereby assigning Kofiau, Gebe and Gag to Wallacea. However, that geological definition does violence to biogeographic criteria, because the avifaunas of Kofiau, Gebe and Gag are predominantly Papuan rather than Wallacean. Hence all recent ornithological treatments (Mayr 1941, 1954, White & Bruce 1986, Coates & Bishop 1997) include Kofiau, Gebe and Gag within the Papuan Region and thus take Wallacea's eastern boundary to lie slightly west of the Sahul Shelf's edge. As Mayr (1976: 636) expressed it, ' . . . these islands are so purely Papuan [now known to be an exaggeration] that it seems justified to be slightly inconsistent.' We agree.

Conservation status

Kofiau's five endemics—its two endemic allospecies of kingfisher and monarch, and its three endemic subspecies of warbler, fantail and sunbird—are presently among Kofiau's most abundant species. All five are widespread in primary and secondary forests, except that the sunbird is only in secondary forests. The three endemic subspecies are not in immediate danger.

However, there are reasons to be concerned about the long-term survival of the two endemic allospecies, which we shall explain according to the threat categories and criteria used by IUCN (2001). These two allospecies are currently classified as Data Deficient (BirdLife International 2007). We propose that both be treated as Endangered based on IUCN criteria EN B1+2ab(iii) (IUCN 2001). Both species, on present knowledge, are confined to the island of Kofiau proper, an area of 144 km^2. Even if they occurred on some satellites in the group, their Extent of Occurrence delineated by the minimum convex polygon spanning the entire group could never exceed 5,000 km^2 (IUCN criterion B1), and their Area of Occupancy at full saturation of the entire group at the IUCN 4 km^2 grid cell reference scale could never exceed 500 km^2 (criterion B2). The entire island of Kofiau can only be regarded as a single location with regard to applying IUCN qualifier a (<5 locations; qualifier a). Our observations show that, whilst both species persist in shaded, traditional subsistence gardens, they are commonest in closed-canopy secondary and primary forest. We also found circumstantial evidence that immatures of the kingfisher may depend entirely on tall closed-canopy forest during their early life stages (see below). Kofiau has been extensively selectively logged since the 1970s, and the infertile limestone substrates delay forest regeneration. Establishment of new subsistence gardens and cash-crop coconut groves by slash-and-burn methods, as well as small-scale timber extraction in the remaining patches of primary forest such as on Mata Hill, were all evident during our visits. We conservatively estimate that agricultural clearings increased by 30% along our trans-island transect during the five-year period spanning our 2002 and 2007 visits. The 4 km^2 IUCN reference scale is too coarse to trigger complete local extirpation and a reduction in Area of Occupancy (IUCN qualifier b(ii)) because some individuals are still likely to persist within the non-forest matrix at this scale. However, the general picture emerging is that of continuous internal degradation of remaining primary forest, conversion of secondary forest to cash-crop coconut groves, and scaling-up of traditional subsistence gardens, and we believe that IUCN qualifier b(iii) is met. The future of Kofiau's endemic birds will require efforts to protect remaining tracts of primary forest in a consensus conservation area through participatory mapping with local communities and landowners.

Annotated list of selected species

We comment here on Kofiau's five endemics, and on three Kofiau populations constituting first or second records for the Papuan Region.

SPOTTED KESTREL *Falco m. moluccensis*
The only other Papuan record of this widespread Wallacean non-forest species is from Gag, where JD & KDB observed at least three pairs in 1986 and Johnstone (2006) found individuals and pairs uncommonly in 1997. On Kofiau, in 2002 we (IM and LW) observed daily an adult pair with two volant but incessantly begging juveniles near a tall forest-edge tree with a cavity at 20 m pointed out to us as the nest hole. In 2007 we observed two individuals at separate locations 2.5 km from the 2002 nest site. In their heavily blackish-spotted underwing-coverts, and the adults' lack of pale greyish cheeks, the Kofiau birds resembled the Moluccan race *F. m. moluccensis* (as Johnstone also concluded for Gag birds) rather than *F. m. microbalius* of other Wallacean islands.

SPECTACLED IMPERIAL PIGEON *Ducula perspicillata* ssp.
This is the first record of this widespread Moluccan species for the Papuan Region. We found it abundant in the canopy of primary and secondary forests, and remnant trees in gardens, singly or in groups of up to 30, far outnumbering its congener *D. myristicivora*. Plumage seemed closer to that of *D. p. neglecta* of Seram than to *D. p. perspicillata* of the Northern Moluccas and Buru, but we noted the leg coloration as pale greyish, rather than purple (Salvadori 1880–82) or pinkish (Coates & Bishop 1997). We recorded three vocalisations: a far-carrying, descending series of *c.*7 hoarse notes, the first at a lower pitch than the second, similar to the call of Floury Imperial Pigeon *D. pistrinaria* of the Papuan Region and Northern Melanesia; a soft, short, ascending *br-r-r*; and a low-pitched slow note that rises and then falls in pitch.

KOFIAU PARADISE KINGFISHER *Tanysiptera ellioti*
This beautiful endemic allospecies is abundant, tame and solitary in tall shaded primary and secondary forests, and (adults but not immatures) also in shaded gardens, perching at 1–12 m but not venturing higher into the canopy. It holds perches for as long as several minutes. In July 2002 we recorded immatures only from tall closed-canopy forests, with home ranges centred on then-dry forest pools or small streams, suggesting narrower ecological requirements in immatures than adults. Soft-part colours of adults: bill blood red, iris very dark, legs dull olive; of immatures: bill blood red, often with darker cutting edges and dark brownish markings along culmen, usually on the centre; iris very dark brown or greyish black, legs pale yellowish green, claws posteriorly dark horn or blackish and anteriorly yellowish beige. Name, in the Raja Ampat dialect of the Biak language spoken on Kofiau: Mampitasoi ('Mam' means 'bird').

We heard four vocalisations. The primary song is a soft, musical, ascending, accelerating, rapidly trilled series of notes lasting 1.5–2.0 seconds, similar to the song of Galatea Paradise Kingfisher *T. galatea* but more plaintive and shorter. Agitated individuals repeatedly gave a shortened version of the song. The call, given by individuals seen near the ground, is a series of three identical soft, mournful, high-pitched, slow downslurs; in some cases each note is slightly upslurred at the end. Finally, on a few occasions we heard three loud unmusical downslurs with the quality of an adolescent boy whose voice is breaking.

LARGE-BILLED GERYGONE *Gerygone magnirostris occasa*
Common in all wooded habitats from primary forest to mangrove, sago swamps and gardens with trees, at any height from the understorey to the canopy, and foraging alone by gleaning. That broad habitat range on Kofiau contrasts with the New Guinea mainland and with all four continental Western Papuan Islands (Batanta, Misool, Salawati and Waigeo), where several forest-dwelling congeners (Green-backed Gerygone *G. chloronota*, Yellow-bellied Gerygone *G. chrysogaster* and Fairy Gerygone *G. palpebrosa*) occur, and where we found *G. magnirostris* mainly restricted to mangrove and to riverine vegetation. Amongst New Guinea gerygones, this is the sole species to disperse across water to oceanic islands of the Papuan Region, including Biak, Karkar, Manam, Misima, Rossel and Tagula. We often heard the song, which is a light, fast, tinkling, repeated phrase similar in quality to the song of *G. chloronota*.

Ripley (1957) described this endemic subspecies from a single specimen on the strength of its 'being much more richly yellow on the abdomen, vent and undertail coverts' and exhibiting 'darker, or brownish olive upperparts' than geographically proximate forms. We did not detect those features of Kofiau birds compared to birds that we saw in the previous and following weeks on Batanta, Misool, Salawati and Waigeo. At the time of Ripley's description, the most recent specimens available for comparison from those islands were considerably older and possibly had undergone post-mortem colour changes through foxing. Hence the validity of this subspecies demands confirmation. We noted Kofiau birds in life as having a distinct white eye-ring, rufous face- and neck-sides, buffy flanks, and white throat and central belly.

NORTHERN FANTAIL *Rhipidura rufiventris vidua*
Common and widespread in forest and wooded habitats, including second growth and coconut groves with scrub, from 1–25 m, foraging by long swoops and sallies and returning to the original perch. Seen alone or with Kofiau Monarch *Monarcha julianae*; aggressive towards Yellow-capped Pygmy Parrot *Micropsitta keiensis*, Shining Flycatcher *Myiagra alecto* and Black Sunbird *Nectarinia aspasia*. This dark, cleanly patterned endemic subspecies is closest to *R. r. obiensis* of Obi. The song is a descending weak series of 3–5 whistled notes, occasionally preceded and / or followed by several other notes of similar quality.

KOFIAU MONARCH *Monarcha julianae*
Abundant in primary and secondary forest, at heights of 1–30 m. Often in pairs of two identical birds, occasionally followed by a Northern Fantail *Rhipidura rufiventris* sallying presumably for insects disturbed into flight by the *M. julianae*, which rarely sallies. Active and tame, often flicking its wings and tail. It forages within a tree rather than at the tips of branches, by hover-gleaning, quick short hops of 0.3–1.0 m along a branch, and working vertically up a tree or vine.

Its three types of vocalisations are similar to those of many other monarchs, and are especially similar to those of Spot-winged Monarch *M. guttulus* and Hooded Monarch *M. manadensis*: a weak, tremulous, high-pitched note repeated three times at intervals of two seconds; a short, dry, buzzy rasp or squawk; and a rapid series of squawks.

In life, presumed adults have the upperparts, wings, face and throat black, the posterior margin of the black throat rounded; white underparts, extending anteriorly onto the sides of the throat to behind the eye; top of the head pearly grey; tail ventrally black at the base, tip and medially, with broad white outer margins; bill bluish, legs dull blue-grey, eye black. All adults observed closely in 2002 had tiny white elongated spots along the shafts of the outer greater wing-coverts, but no adults seen in 2007, and only one in 1986, had such spots.

With one exception, presumed non-adults had the crown, mantle and rump dull grey, wings and tail brown, belly white, breast orange, a dark ear patch and area around the eye, a pale spot in front of the eye, and tail margins of reduced extent and off-white. The sole exception was an individual, accompanied by an adult, which had the entire upperparts (including the crown) and wings brown, the tail's underside paler brown without any visible white, the underparts dirty white extending to behind the eye as in the adult, and a dark but not black face patch.

M. julianae is very similar to *M. guttulus* in plumage, size, vocalisations and behaviour. The main distinctions of adult *M. julianae* from *M. guttulus* are that its back and wings are black not grey, white spots on the upper wing-coverts are tiny or absent, and the black throat extends less far posteriorly onto the breast. On Kofiau we observed no *M. guttulus;* all adult pied monarchs observed were similar except for the above-mentioned occasional presence of tiny white spots on the upper wing-coverts.

In describing *M. julianae* as a new species, Ripley (1959) stated that it occurs sympatrically on Kofiau with *M. guttulus* on the basis of a monarch specimen collected there by Beccari in 1875 and held in the Museo Civico di Storia Naturale, Genoa. Salvadori (1880–82, vol. 2: 23) had identified the specimen as a *M. guttulus* not quite adult, and differing from other *M. guttulus* specimens in lacking white spots on the upper wing-coverts and with the black of the throat less extensive posteriorly. That description suggested *M. julianae*. Hence JD wrote Dr Carlo Violani (University of Pavia), who with great kindness described in detail, measured, photographed and compared with *M. guttulus* Beccari's single Kofiau

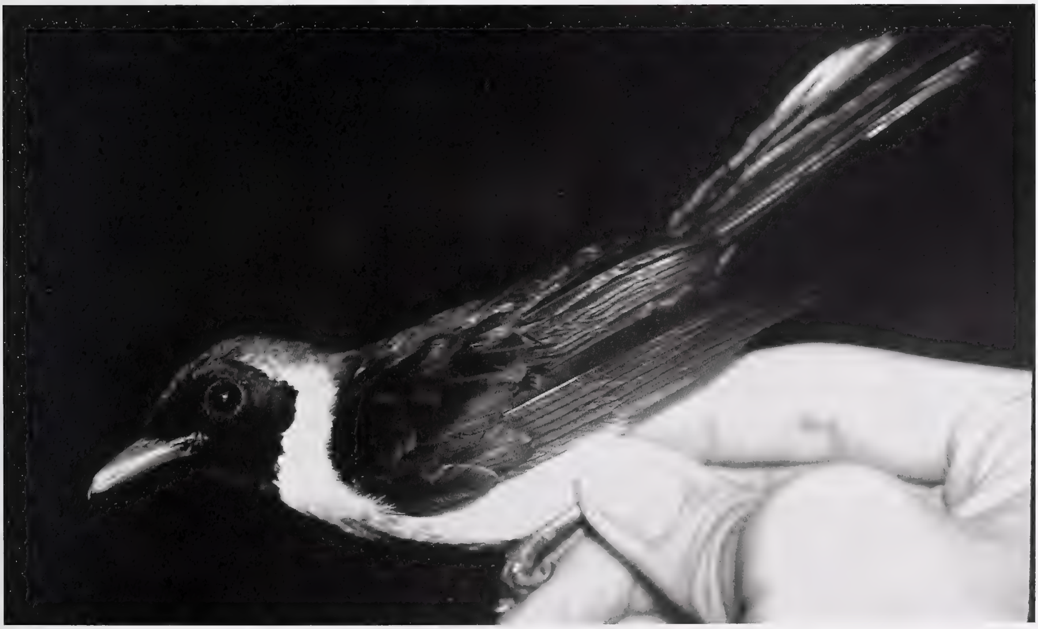

Figure 3. Adult Kofiau Monarch *Monarcha julianae* (Iwein Mauro); this monarch flycatcher is endemic to Kofiau.

specimen, and then sent Beccari's specimen to the American Museum of Natural History (AMNH), New York, where JD compared Beccari's specimen with Khakiaj's unique type specimen (adult) of *M. julianae* borrowed from Yale's Peabody Museum of Natural History, plus the extensive series of adult and young *M. guttulus* at AMNH.

These comparisons confirmed, in the adult *M. julianae* type, the distinctions of *M. julianae* from *M. guttulus* that we observed in the field. The only other apparent distinction worth mentioning is that the black bib of the *M. julianae* type is narrower and more diamond-shaped (as noted by Ripley 1959) than in life; that appears to be an artefact of the type's preparation. The Beccari specimen agrees with the *M. julianae* type and with our field observations in (compared to *M. guttulus*) the absence of white spots on the upper wing-coverts, reduced posterior extent of the black throat, closer approach of white on the throat-sides to the eye, and perhaps more extensive white distally on the undertail. Beccari's specimen differs from adult *M. julianae* mainly in that the primaries are grey-brown not black, the back is slate blue-grey not black, and the superciliary is mottled grey and black rather than clean black, which features led Salvadori to identify it as a subadult *M. guttulus*, and not to recognise it as an endemic taxon in 1875. The dorsal blue-grey and ventral white of Beccari's specimen suggest that it represents a more advanced plumage than the brown-backed orange-breasted non-adults that we observed. Evidently, Beccari's specimen is a not fully adult *M. julianae*, and there is thus no evidence for sympatry of *M. guttulus* and *M. julianae*.

In short, we conclude that *M. julianae* is an endemic allospecies occurring on Kofiau in allopatry, and belonging to the same superspecies as either *M. guttulus* or (as suggested by Ripley) *M. manadensis*. Filardi & Smith's (2005) molecular evidence suggests that the latter superspecies is polyphyletic. Considerations in favour of the relationship with *M. guttulus* rather than with *M. manadensis* are the white spots on the wing-coverts of many adults of *M. julianae* (similar to but smaller than the spots of *M. guttulus*); and the fact that *M. guttulus* is a successful island colonist present on 15 islands of the Papuan Region besides New Guinea itself (including four of the Western Papuan Islands), but that *M. manadensis* occurs on no island except New Guinea. These relationships warrant further study.

BLACK SUNBIRD *Nectarinia aspasia mariae*

Common in secondary forest, gardens and coconut groves, often feeding at coconut flowers, but absent from primary forest. Described by Ripley (1959), and accepted by Mees (1965), as an endemic subspecies closest to the nominate New Guinea race but differing somewhat in coloration.

BLACK-FACED MUNIA *Lonchura molucca*

Encountered only on our 2002 visit, when on several occasions we observed a group of two adults and five immatures in an old overgrown coastal garden with alternating grassland and low scrub, on the Kofiau mainland opposite Deer Island. Second record for the Papuan Region, where it was previously recorded by Johnstone (2006) from Gag.

Acknowledgements

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First records of Fine-barred Piculet *Picumnus subtilis* from Acre, western Amazonia, Brazil

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SUMMARY.—Fine-barred Piculet *Picumnus subtilis* is a poorly known south-east Peruvian endemic. Here we present the first records for Brazil, from Acre state: a specimen collected on the rio Macauã, in March 1998, and a sight record from the rio Purus, in August 2007. The new records extend the species' range more than 400 km to the east.

The genus *Picumnus* is restricted to the Neotropics, except the Speckled Piculet *P. innominatus* of India and south-east Asia (Winkler & Christie 2002). This unusual distribution represents one of the most intriguing problems in avian phylogeny and biogeography. Nevertheless, the genus forms a well-defined monophyletic group (Goodge 1972, Winkler & Christie 2002, Benz *et al*. 2006).

Fine-barred Piculet *Picumnus subtilis* is considered endemic to south-east Peru, at the base of Andes and in the Ucayali and Madre de Dios drainages (Short 1982, Schifter 2000, Winkler & Christie 2002, Lane *et al*. 2004, Walker *et al*. 2006; Fig. 1). It was described as recently as 1968 (Stager 1968), from Hacienda Villacarmen (12°51′S, 71°15′W), dpto. Cuzco, and is sympatric in south-east Peru with Gold-fronted Piculet *P. aurifrons* and in central east Peru with Plain-breasted Piculet *P. castelnau* (Stager 1968). It superficially resembles the latter species, but is distinguished by the spotted crown marked with orange, rather than red, in males, and barred chest (Stager 1968, Schifter 2000). It is locally common but geographically range-restricted, occurring in humid tropical forests at 200–1,100 m, and its natural history is poorly known (Winkler & Christie 2002, Schulenberg *et al*. 2007). Although formerly considered Near Threatened, the species is not currently assigned any degree of threat (IUCN 2007). Here we present the first two records of *P. subtilis* for Brazil.

In March 1998, PM visited the rio Macauã (09°52′S, 69°23′W), a tributary of the Iaco, which in turn flows into the Purus, in south-west Brazilian Amazonia, where he collected an adult male *P. subtilis*, held in the Museu de Zoologia da Universidade de São Paulo (MZUSP), Brazil. The specimen (MZUSP 76408) presents all of the diagnostic features of *P. subtilis* including the dorsal and ventral barring, white-spotted crown and more orange-red nape and forecrown. It was moulting primaries nine and ten, and measured: wing 49.6 mm; tail 31.8 mm; exposed culmen 11.7 mm; tarsus 9.2 mm.

P. subtilis was also recorded by EG and SD on 17–31 August 2007 on the upper Purus, at a locality known as 'Santa Cruz Velha', on the right bank of the river (09°00′S, 69°32′W). At dawn on 30 August 2007, SD heard a *Picumnus* vocalisation similar to Golden-spangled Piculet *P. exilis*. The bird was located foraging high in a *terra firme* forest edge dominated by the bamboo *Guadua weberbaueri*. Shortly afterwards two piculets were seen *c*.8 m above ground, but were quickly lost to view. Subsequently, one bird flew down to *c*.1.5 m above ground, making it easy to distinguish from Rufous-breasted Piculet *P. rufiventris*, which is fairly common in such habitat in Acre (one specimen was collected at the same locality and deposited in the Museu Paraense Emílio Goeldi, Belém, collection [MPEG 63298]).

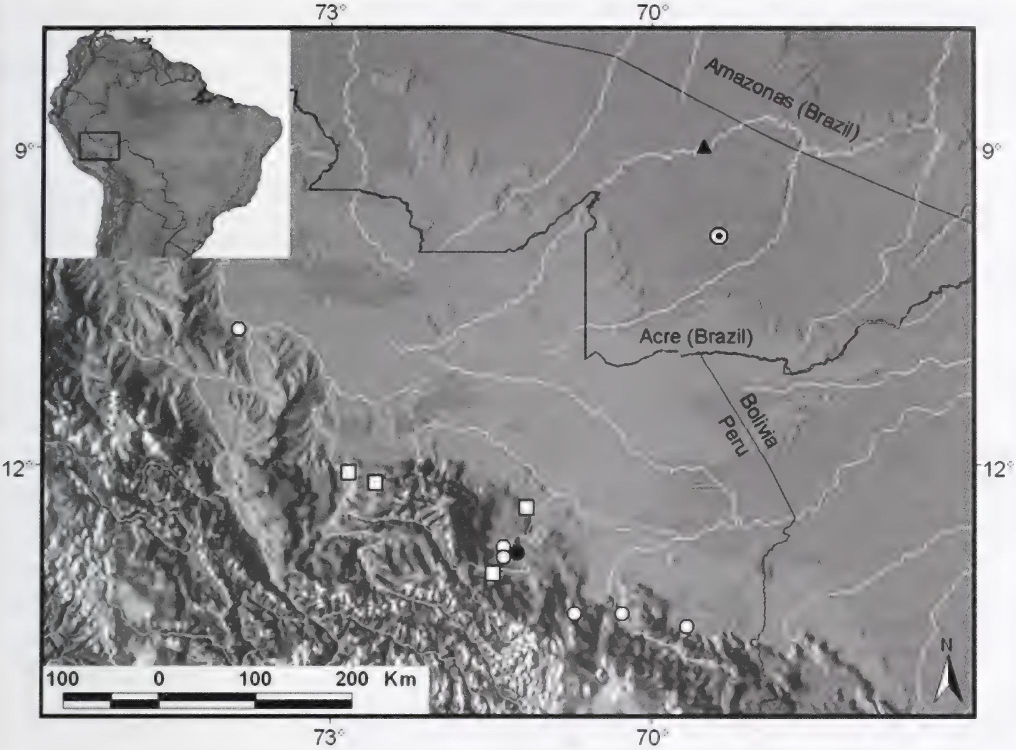

Figure 1. Updated distribution of Fine-barred Piculet *Picumnus subtilis*. The dotted circle represents the MZUSP specimen and filled triangle the sight record made by EG and SD. Circles represent specimen localities (the type locality is denoted by the filled circle). Unfilled squares represent sight records from Peru.

Several other bamboo specialists were noted in the same habitat as *P. subtilis*: Flammulated Pygmy Tyrant *Hemitriccus flammulatus*, Long-crested Pygmy Tyrant *Lophotriccus eulophotes*, Manu Antbird *Cercomacra manu* and Goeldi's Antbird *Myrmeciza goeldi*, but the piculet did not appear to form mixed flocks with these species. EG and SD tape-recorded the piculets' vocalisations (comprising five notes with even-spaced intervals: *si, si, si, si, si*), and endeavoured to attract them using playback, but they were not responsive. The following day, SD observed the species again and was able to make better recordings and take photographs.

The recordings (available at www.xeno-canto.org) were compared with the voices of other piculets that occur in the area based on Erize *et al.* (2006), including *P. subtilis* and *P. castelnau*, enabling SD and EG to be confident of their identification.

These records from Acre represent not only the first Brazilian records but also a range extension of *c.*400 km north-east, and both are from the lowlands. Previously considered endemic to Peru (Erize *et al.* 2006, Schulenberg *et al.* 2007), the species' presence in Brazil might suggest that its range is more closely associated to the distribution of bamboo vegetation than to the Andes foothills (D. F. Lane pers. comm.). However, *P. subtilis* was not recorded along the upper rio Juruá, Acre, in bamboo, despite fairly intensive field work that yielded several new species for Brazil, among them three bamboo specialists (Whittaker & Oren 1999, Whittaker *et al.* 2002). This suggests that, in Brazil, the species may be restricted to the Purus drainage, and will not be found along other rivers with extensive bamboo in Acre and neighbouring south-west Amazonas (A. Whittaker pers. comm.). Nevertheless, studies of other suitable areas in Acre are needed to more reliably determine the distribution and population of this poorly known piculet, along with other species such as the recently described Rufous Twistwing *Cnipodectes superrufus* (Lane *et al.* 2007, Tobias *et al.* 2008).

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APPENDIX 1

Sources used to prepare the distribution map: AMNH = American Museum of Natural History (New York); FMNH = Field Museum of Natural History (Chicago); NMW = Naturhistorisches Museum Wien (Vienna); PM = Peabody Museum of Natural History, Yale University (New Haven); MNHN = Muséum National d'Histoire Naturelle (Paris); MZPW = Museum and Institute of Zoology, Polish Academy of Sciences (Warsaw); MZUSP = Museu de Zoologia da Universidade de São Paulo (São Paulo).

Locality	Reference / observer	Specimen / sight record
Santa Rosa, upper río Ucayali, dpto. Ucayali, Peru	Stager (1968)	AMNH
Timpía, dpto. Cuzco, Peru	N. Gerhart (unpubl.)	sight
Kapiromashi, dpto. Cuzco, Peru	Lane & Pequeño (2004)	sight
Quebrada Aguas Calientes, 2.75 km east of Shintuya, upper río Madre de Dios, dpto. Madre de Dios, Peru	Walker *et al.* (2006)	sight
Moskitania, 13.4 km north-west of Atalaya, upper río Madre de Dios, dpto. Madre de Dios, Peru	FMNH specimen database	FMNH
Hacienda Villacarmen, dpto. Cuzco, Peru	Stager (1968)	FMNH
Hacienda Amazonia, dpto. Madre de Dios, Peru	FMNH specimen database	FMNH
Consuelo, 15.9 km south-west of Pilcopata, dpto. Cuzco, Peru	Walker *et al.* (2006)	sight
Sangaban, dpto. Puno, Peru	Schifter (2000)	NMW
Cadena, dpto. Cuzco, Peru	T. Schulenberg (pers. comm.)	MNHN
Cadena, dpto. Cuzco, Peru	Stager (1968)	YPM
Hacienda Cadena, dpto. Cuzco, Peru	Stager (1968)	FMNH
Huaynapata, dpto. Cuzco, Peru	T. Schulenberg (pers. comm.)	MNHN
Marcapata, dpto. Cuzco, Peru	T. Schulenberg (pers. comm.)	MZPW
Candamo, dpto. Puno, Peru	Stager (1968)	AMNH
Rio Macauã, Acre, Brazil	present work	MZUSP
Santa Cruz Velha, right bank of rio Purus, Acre, Brazil	present work	sight

Kinglet Calyptura *Calyptura cristata* (Vieillot, 1818): documented record for the state of São Paulo and taxonomic status of the name *Pipra tyrannulus* Wagler, 1830

by Renata Stopiglia, Lorian C. Straker & Marcos A. Raposo

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A specimen (ZMB 2306) of Kinglet Calyptura *Calyptura cristata* (Vieillot, 1818) collected in the state of São Paulo by Friedrich Sellow (1789–1831) and Ignaz Franz J. M. von Olfers (1793–1872) was rediscovered in the ornithological collection of the Museum für Naturkunde (ZMB) in Berlin in 2007. The finding has important consequences for the nomenclature of this taxon as well as for knowledge of its distribution.

Concerning its nomenclature, the species *Calyptura cristata* was originally described by Vieillot (1818: 528) as *Pardalotus cristatus* based on a specimen collected by Pierre Antoine Delalande in Rio de Janeiro. The type specimen is held at the Muséum d'Histoire Naturelle de Paris (General Catalogue 2004–300). Nowadays, the genus *Pardalotus* Vieillot, 1816, is applied to a small family of oscines (Pardalotidae) confined to Australia. Swainson (1832) therefore introduced the genus name *Calyptura* to separate the Brazilian species from the Australian, thereby establishing a new combination for the epithet *cristatus*.

Specimen ZMB 2306 has two significant labels: a type label in red inscribed '*Pipra tyrannulus* Wagler (ex Licht. M.S.)', probably added by Jean Cabanis, curator at ZMB in 1850–92; and

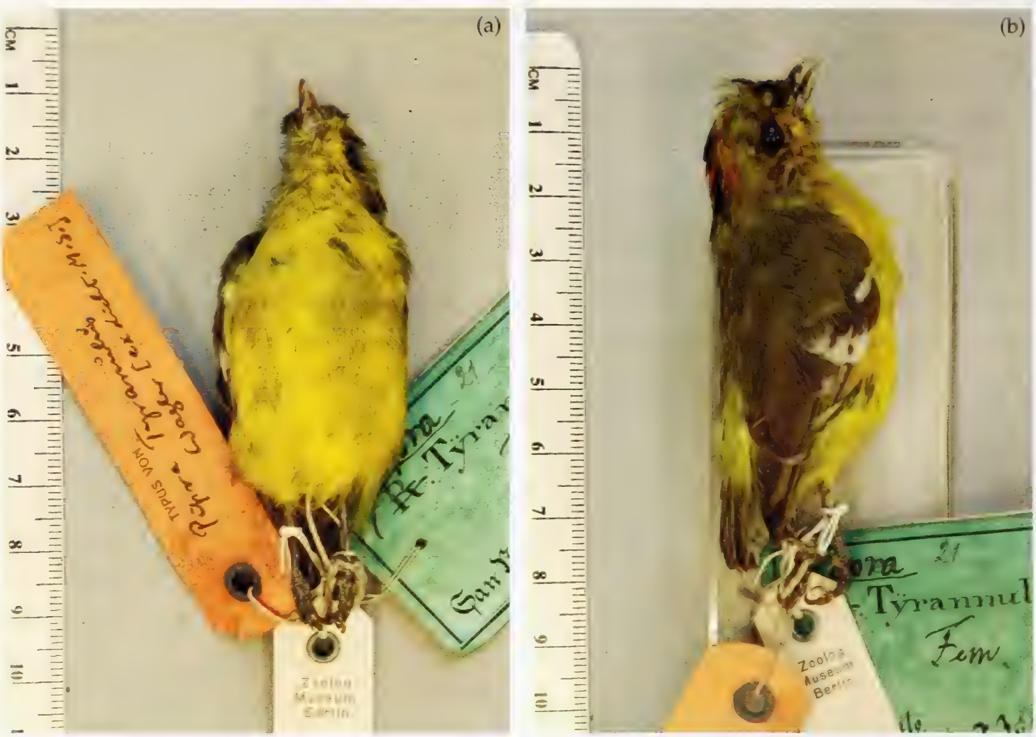

Figure 1. Female Kinglet Calyptura *Calyptura cristata* specimen (ZMB 2306) collected by Sellow and Olfers in the state of São Paulo, Brazil, and held at the Museum für Naturkunde, Berlin: a) dorsal view; b) lateral view (Marcos A. Raposo)

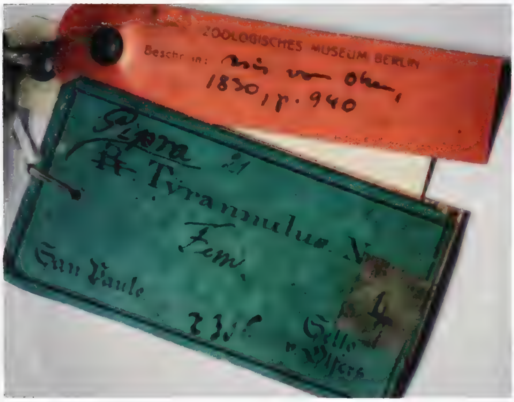

Figure 2. Close-up of the labels attached to specimen ZMB 2306 of Kinglet Calyptura *Calyptura cristata* held at the Museum für Naturkunde, Berlin (Pascal Eckhoff)

a green label from the original mount that identifies the specimen as *Pipra* (*R.*) *tyrannulus* and describes it as a female collected in São Paulo by Sellow and Olfers (Figs. 1–2). In reference to the type of *Pipra tyrannulus* Wagler, 1830, it seems Wagler (1830) worked on a revision of the genus *Pipra* and proposed, amongst others, a new combination for '*Regulus tyrannulus* Lichtenstein' (cited without dates or references). Furthermore, history has treated the name *tyrannulus* in two distinct ways. Sclater (1888: 394) treated *Pipra tyrannulus* Wagler, 1830, as a synonym of *Calyptura cristata* (Vieillot, 1818), whereas Hellmayr (1929: 127) stated *Pipra tyrannulus* Wagler, 1830, to be a new name for *Pardalotus cristatus* Vieillot, 1818.

Analysing the specimen and literature, it is clear to us that Wagler (1830) was first to publish the name *tyrannulus*, which he considered to be Lichtenstein's. Although Johann Georg Wagler (1800–32) never claimed to be the author of the specific name, under the terms of the Code (ICZN 1999) he is, nevertheless, its author; his reference to a MS name of Lichtenstein has no standing under the Code. This "M.S." probably referred to the label data attached to the specimen or, implausibly, to an unpublished catalogue by Lichtenstein

(D. M. Teixeira pers. comm.). Wagler himself never mentioned *tyrannulus* as being a new name for *cristatus*. Rather, he considered *Pardalotus cristatus* a synonym of *Pipra tyrannulus* in his list. It is worth mentioning that Lichtenstein (1823) did not mention the taxon.

In light of the above, Hellmayr (1929) was incorrect to consider *tyrannulus* a *nomen novum*, whilst Sclater's (1888) treatment of *Pipra tyrannulus* Wagler, 1830, as a junior synonym of *Calyptura cristata* (Vieillot, 1818) is the correct one. This is strongly reinforced by Lichtenstein (1854: 16), who referred to *Calyptura cristata* as the name of this taxon in his *Nomenclator Avium Musei Zoologici Berolinensis*.

Under the Code (Art. 72.7), the name-bearing types of taxa stated to be new names are the original types, 'both the nominal taxa they denote have the same name-bearing type despite any simultaneous restriction or application of the new replacement name (nomen novum) to particular specimens or any contrary designation of type, or any different taxonomic usage of the new replacement name.' So, if Hellmayr (1929) was correct about the *nomen novum* condition of *P. tyrannulus*, ZMB 2306 would lack type material status. In fact, this specimen is more properly considered as one of the syntypes given that at least one other specimen (ZMB 2305, also labelled *Regulus tyrannulus*, from 'Brasilien' and also collected by Sellow and Olfers), was analysed at that time by Wagler.

Most subsequent authors, including Snow (1979), do not mention the name *Pipra tyrannulus*.

Regarding the record for the state of São Paulo, specimen ZMB 2306 was collected by Sellow and Olfers sometime between May 1819 and April 1820 (Berlin museum catalogue data), during their visit to Brazil. According to Urban (1893, 1906) and Hoehne *et al.* (1941), Sellow and Olfers, after eight months collecting in Minas Gerais, initiated their work in the state of São Paulo in May 1819. They worked together until mid July of that year, when Olfers returned to Rio de Janeiro (Urban 1906). During this period in São Paulo, they visited several localities, including Jundiai, Itu and Ipanema, where they spent most time. Sellow left Ipanema in January 1820, collecting in the surroundings of Santos, including the Serra de Cubatão and Rio das Pedras, until mid-April 1820, when he commenced his journey to Rio de Janeiro (Urban 1893, 1906, Hoehne *et al.* 1941).

The range of *Calyptura cristata* has long been considered to comprise just a few localities in Rio de Janeiro, despite that D. F. Stotz (*in* Ridgely & Tudor 1994: 737) hypothesised that the species might be found in north-east São Paulo, at Ubatuba. Indeed, Sigrist (2006) recently reported a possible sight record from São Paulo. Now, based on label, catalogue and historical data, the Berlin specimen of *C. cristata* (ZMB 2306) confirms that this enigmatic species does (or did) occur in São Paulo.

Acknowledgements

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The identity of the type species of the cuckoo-dove genus *Macropygia* Swainson, 1837 (Columbidae)

by Richard Schodde

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SUMMARY.—Evidence is presented that the taxonomic identity of the type species of the cuckoo-dove genus *Macropygia* Swainson—*Columba phasianella* Temminck—is of the east Australian form of *Macropygia amboinensis* (Linnaeus), known today as *Macropygia amboinensis phasianella* (Temminck).

When Swainson (1837) described the cuckoo-dove genus *Macropygia*, he cited the species designated subsequently as its type as '*M. phasianella*', with the unelaborated reference 'Pl. Col. 100.' That reference was to pl. 100 in the *Nouveau Recueil de Planches coloriées d'Oiseaux* of Temminck & Laugier (1820–39), hereafter the *Planches coloriées*. The entry for pl. 100 in that work is titled 'Colombe phasianelle. *Columba phasianella*. Temm.', based by reference on a cuckoo-dove that Temminck had described from east Australia (Temminck 1821a). Gregory *et al.* (2007) interpreted Swainson's reference to pl. 100 strictly, building a case that the bird figured was instead Philippine *Macropygia tenuirostris* Bonaparte, 1854, which had first been designated as the taxonomic species involved by Mathews (1920: 9). Thereby they rejected Schodde's (1997: 23) argument that *Columba phasianella* Temminck, 1821, of east Australia was the type species, designated by Selby (1840). Bonaparte (1854) had already concluded that the specimen figured in the *Planches coloriées* was of his new species from the Philippines, a point not in dispute here.

Gregory *et al.* (2007) contended that valid type species designation of *Macropygia* 'must be conditioned by the qualifying 'Pl. Col. 100' imposed by Swainson with the meaning that he indicated the bird depicted and not the later text to that plate'. In this case, Arts. 69.2.4 and 11.10 of the *International code of zoological nomenclature* (ICZN 1999), hereafter the Code, should apply. These articles validate nominal type species that are applied *deliberately* to taxa different from those originally bearing their name, i.e. are misapplied or 'misidentified' by intention. If Swainson (1837) had nominated *Columba phasianella* on pl. 100 on the explicit grounds that it was not Temminck's (1821a) original *Columba phasianella*, then Gregory *et al.*'s (2007) recognition of *Macropygia tenuirostris* Bonaparte as the taxonomic species involved is correct. Gregory *et al.* (2007) nevertheless did not address this circumstance; nor did they, or Mathews (1920: 9) before them, provide evidence that Swainson had 'expressly stated' that he was consciously referring to a Philippine and not an east Australian cuckoo-dove, as required by Art. 69.2.4.

In fact, Swainson's (1837) bald reference to 'Pl. Col. 100' does not consciously refer to a Philippine cuckoo-dove. Nor does it necessarily refer to the figure alone, divorced from Temminck's text. At least three reasons exist for this. First, the *Planches coloriées* is unpaginated: the only way that Swainson could refer to entries in it, whether figure or text or both, was by quoting the plate number. As text is not *expressly* excluded from figure in his reference to 'Pl. Col. 100', objective interpretation of that reference should treat both. Secondly, although the plate was issued in December 1821 ahead of its text in August 1822 (Stresemann 1922, Dickinson 2001), both had long been available together before Swainson saw them for his description of *Macropygia* in 1837. Significantly, the binomen '*Columba phasianella*' was used only in the title of Temminck's text, not on the earlier figure nor its wrapper (Gregory *et al.* 2007, from Froriep 1822). Thus, in Swainson's full reference—'*M. phasianella* Pl. Col. 100'—plate and text are tied together through the name; and so the text to pl. 100 cannot be excluded from the identification of the type species. Thirdly, major illustrated works were Swainson's (1837) unexplained choice for referencing species characteristic of genera in the encyclopaedia where *Macropygia* was described. Common sense says that he cited figures of species there merely as exemplars of the genera he was describing, and not for intrinsic specific identity. Had he specified Temminck's figure alone because it was a species different from that described in Temminck's text, he would have said so according to the views expressed in his introductory paragraph 220 on p. 201 (Swainson 1837). Instead, he kept Temminck's species name, thereby implicitly accepting *phasianella* in Temminck's taxonomic sense.

Here is the crux of the argument. Type species carry the names of genera, and to function as such they must be taxonomically circumscribed (*cf.* Art.11.10). For Swainson and *Macropygia*, the type species is *Columba phasianella* Temminck according to Temminck's circumscription of the species *phasianella* in the *Planches coloriées*. In that work, Temminck's taxonomic understanding of *phasianella* is made clear in the text and figure for pl. 100 combined, not by the figure alone. What is that understanding? Temminck (1821a) first described *Columba phasianella* from a presumed immature (female) from near Port Jackson (Sydney) in eastern Australia, in May 1821, after examining the specimen in the collection of the Linnean Society on a visit to London in 1819. By the time he began preparing its entry for the *Planches coloriées* about a year later, he had seen adult and male material from elsewhere in the Indo-Australasian archipelago. It led him to broaden his perception of *phasianella* to include similar-looking cuckoo-doves from the Sundas, Moluccas and Philippines, as explained in the following paragraph. Gregory *et al.* (2007) contended instead that Temminck had circumscribed *phasianella* differently in the *Planches coloriées* by including Indo-Philippine populations and excluding Australian (and Moluccan) members.

Thus they treated *Columba phasianella* Temminck in the *Planches coloriées* as a junior homonym of *Columba phasianella* Temminck, May 1821.

This, nevertheless, is an error because, in the account in the *Planches coloriées*, Temminck (1821b, 1822) explicitly included the figured and described adult male from the Philippines *and* his 'immature' from Port Jackson within the *one species* by *express* mention of *both* age forms. The heading and initial sentences of his text state: 'Colombe phasianelle. / *Columba phasianella*. Temm. / L'Adulte - Planche 100. / Nous figurons cet oiseau sous le plumage de l'état parfait. Une courte notice, prise sur un jeune individu tué à la Nouvelle-Hollande, a été donné dans le vol. 13 des Transactions Linnéennes, pag. 129, sous les nom indiqués cidessus'. Confirming the connection is the ensuing account of distribution: 'La Colombe phasianelle paraît répandue dans le plus grand nombre des îles qui forment les archipels de la Sonde, des Moluques, des Philippines, *et jusqu' à la Nouvelle-Hollande*' (italics mine). In pl. 100 of the *Planches coloriées*, the basic reference for type species identity for *Macropygia*, Temminck thus treated Australian, Moluccan and Sunda-Philippine populations as a single species, and employed for them *Columba phasianella* under which he had first described the Australian form.

The type species of *Macropygia* Swainson is thus *Columba phasianella* Temminck, May 1821 = *Macropygia amboinensis phasianella* (Temminck, May 1821), designated by Selby (1840). *Contra* Gregory *et al.* (2007), this does not 'disrupt stability' because *Columba phasianella* Temminck in the taxonomic sense of *Macropygia* (*amboinensis*) *phasianella* (Temminck) has been used as the type species of *Macropygia* by more authors (Salvadori 1882, 1893, Wardlaw Ramsay 1890, Mathews 1910–11, Condon 1975, Schodde 1997) and over a longer period than in the sense of *Macropygia tenuirostris* Bonaparte (RAOU Checklist Committee 1926, Mathews 1927, 1946, Peters 1937).

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A substitute name for *Dryobates minor heinrichi* von Jordans

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The name *heinrichi* was applied as new to two different species of woodpecker in the genus *Dryobates* in 1940. The collector in both instances was Gerd Heinrich.

One of the two, *Dryobates hyperythrus heinrichi* Stresemann, 1940, a race of Rufous-bellied Woodpecker that was described from Mt. Victoria in western Burma, did not appear in Peters (1948), perhaps because it was not listed in the *Zoological Record* before then. Indeed World War II might have led to the name being completely ignored had not Smythies (1953) listed it, and he seemed to accept the name as valid. However, a rapid re-evaluation suggests that these specimens fall within the range of colour variation exhibited by nominotypical *hyperythrus*. Stresemann suggested that Mt. Victoria birds are shorter winged, but the number of available specimens is small and we prefer to treat this name as a synonym of nominate *hyperythrus*. The holotype and four paratypes are in the Museum für Naturkunde, Leibniz-Institut für Evolutions-und Biodiversitätsforschung an der Humboldt-Universität zu Berlin.

In the same year, a Bulgarian population of Lesser Spotted Woodpecker was named *Dryobates minor heinrichi* by von Jordans (1940: 131). This name did appear in Peters (1948: 196), as a synonym of *Dendrocopos minor serbicus* Buturlin.

The discovery of homonymy in the same year led us to explore the dates of publication in more detail to determine priority. The paper on the birds of Mt. Victoria in the 1939 volume of the *Mitteilungen der Zoologische Museum Berlin* by Stresemann & Heinrich is the first paper in part 2 of that volume, and the first page of that paper, and of the part, is dated 1939. However, the title page is dated 1940 and states 'Ausgegeben am 18 Januar 1940'.

The description of the Bulgarian woodpecker is in a volume dated 1940 and at the end of the article in which it is described are the words, on p. 152, 'Im Druck erschienen am 1.II.1940'. It is thus clear that Stresemann's Burmese bird was the first named.

In place of *Dryobates minor heinrichi* von Jordans, 1940, we now propose the following name, which continues to honour the collector as von Jordans wished.

Dendrocopos minor gerdi nom. nov.

The holotype, collected on 6 June 1935 was originally given no. 38875 in the Alexander Koenig collection, but in the Zoologisches Forschungsinstitut und Museum Alexander Koenig it is now catalogued as ZFMK 38.614 (*cf.* van den Elzen & Rheinwald 1984: 99).

Although this taxon is described in a paper reporting on an expedition of Adolf von Jordans, Wolf, Breining and Pateff in 1937, its holotype was collected in south-east Bulgaria on an earlier trip by Heinrich. Of the 13 paratypes, one is also in Bonn, 11 are in Warsaw (Museum and Institute of Zoology, Polish Academy of Sciences) and one has not been traced.

Primary homonymy requires that the new name be used for the Bulgarian population when the latter is recognised taxonomically. This is the case whether one follows Dickinson (2003), where the genus *Hypopicus* was used for Rufous-bellied Woodpecker, or Winkler & Christie (2002), where *Dendrocopos* was used for both species.

Acknowledgements

The discovery of this homonymy arose during work on the *Howard & Moore complete checklist of the birds of the world* (Dickinson 2003). We thank Zlatozar Boev for a copy of the original description of the Bulgarian taxon and for supplying evidence that confirmed the date, and Renate van den Elzen for confirming that the catalogue number in Bonn is correct and that the number given in the original paper is unexplained. Comments from a reviewer (Richard Schodde) much improved the clarity of this note.

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rrespondence on all general Club matters should be addressed to: The Hon. Secretary, S.A.H. (Tony) Statham, hlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. E-mail: boc.sec@bou.org.uk. See inside front cover details of Club meetings.

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As far as possible, review, return of manuscripts for revision and subsequent stages of the publication process will be undertaken electronically.

For instructions on style, see the inside rear cover of Bulletin 129 (1) or the BOC website

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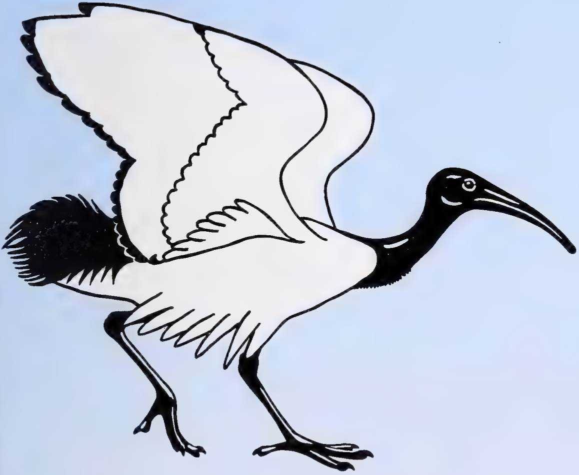

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MEETINGS are normally held on the ground floor of the Sherfield Building of **Imperial College**, South Kensington, London, SW7. This suite is now called the **Tower Rooms** and meetings will take place in **Section C** with the entrance opposite the Queen's Tower in the main quadrangle. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

PLEASE NOTE THE MINOR CHANGE TO OUR REGULAR VENUE (see above).
Section C of the renamed TOWER ROOMS is to the east of the previous venue of the Ante-room which no longer exists; this is nearer to the main entrance off Exhibition Road but still part of the Sherfield Building.

---

26 January—Chris Bowden—*Conserving the Northern Bald Ibis: what's being done to halt centuries of decline in Morocco, Syria, Turkey and elsewhere?*

Chris Bowden is the international species recovery officer for the Royal Society for the Protection of Birds (BirdLife in the UK), especially for *Gyps* vultures in Asia and the Northern Bald Ibis *Geronticus eremita* in Morocco, Syria and Turkey.

Applications to Hon. Secretary (address below) by **12 January 2010**

---

16 March—Dr Julian Hume—*Birds of the Comoros Islands*

Dr Hume is a research associate of the Natural History Museum and is currently working on fossil birds of the south-west Indian Ocean.

Applications to Hon. Secretary (address below) by **2 March 2010**

Dates for Tuesday evening meetings in the remainder of 2010 have been selected as follows:

27 April (incl. AGM); 22 June; 21 September—speakers to be announced.

2 November—Michael Jennings—*Bird distribution in Arabia*

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876995 (or e-mail: boc.sec@bou.org.uk).

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CLUB ANNOUNCEMENTS

Honorary Secretary and Meetings Organiser

Members will note the extra insert advertising the post of Honorary Secretary and Meetings Organiser. After five years in this role, Tony Statham plans to stand down as Secretary in April 2010. We are therefore now looking for someone with energy and ideas to work with the Chairman and Committee in the management of the Club, as Secretary and overall organiser of the dinner meetings and lectures. The main responsibilities are to:

- organise and attend Club meetings, liaising with Imperial College re dates, accommodation and menus, and with speakers;
- organise and attend all Committee meetings, producing papers in consultation with the Chairman and taking the minutes;
- update and consult Committee members on matters which arise between meetings;
- prepare the first draft of the Annual Report, produce the Club Announcements for the Bulletin and contributions for the website; and
- represent BOC at Joint Publications Committee and BOU Meetings Committee when required.

The Club currently holds six meetings a year, usually in London. Committee meetings are held immediately before Club meetings but we are aiming to conduct more of our business by e-mail and reduce the number of formal Committee meetings to a maximum of four per annum. A full job description for the post is available.

Members are reminded that subscriptions are due for renewal on 1 January 2010 and are again respectfully requested to check that any standing orders are correctly lodged with their banks. Subscriptions are £20 per annum irrespective of whether the subscriber is a member of the BOU or not.

REVIEWS

Mann, C. 2009. *The birds of Borneo: an annotated checklist*. BOU Checklist No. 23. British Ornithologists' Union & British Ornithologists' Club, Tring. 440 pages, several maps and 68 colour plates. UK£50.00.

The world's third largest island, Borneo has long been recognised for its rich and diverse avifauna comprising 630 species and many endemics, these latter numbering 41–47 species (depending on species limits, specimen provenance and possible hybridism), five endemic genera and one endemic family. This latest publication in the BOU Checklist series provides an up-to-date summary of the avifauna of this fascinating region.

The introduction covers a brief history of Borneo, geography, geology, topography and climate, vegetation, other fauna, a history of ornithology in Borneo, a brief general overview of the avifauna, and bird conservation. The author has sensibly adopted an approach to taxonomy close to that espoused by the BOURC. Thus the parapatric Garnet Pitta *Pitta granatina* and Black-headed Pitta *P. ussheri* are split and some isolated populations are considered sufficiently different to be treated as full species (e.g. Long-billed Partridge *Rhizothera longirostris* and Dulit Partridge *R. dulitensis*).

The main body of the work is the systematic list, which follows a similar format to previous publications in the series. Each species account includes sections on distribution, habitat and, where appropriate, breeding and taxonomic notes. There is a great deal of information buried within these, but I found the way in which they are presented does not make the data particularly accessible. Frequently the accounts seem to consist of lists of locations and altitudes punctuated by reference to source works. Occasionally, I found it difficult to interpret the information presented. Whilst one can dip in this book to answer a particular question about Borneo's birds, it is not a publication with which to sit down and enjoy a good read!

A section of photographs, scattered over 28 pages, includes 42 plates of Bornean landscapes and a further 26 of birds. The reproduction is excellent and there are some wonderful images, with those of Blue-headed Pitta *Pitta baudii*, and Rhinoceros *Buceros rhinoceros* and Helmeted Hornbills *Rhinoplax vigil* being particularly pleasing. Other images are less successful and one would think that better photographs of Bornean Whistler

Pachycephala hypoxantha should be available, and a quick search of the Oriental Bird Club's image database quickly proves they are. A gazetteer and list of references conclude the book.

This publication provides an important summary of the current knowledge of the distribution of Borneo's birds. However, the price of £50 is not cheap and will inevitably reduce the market for this publication significantly. Whilst libraries and academic institutions will doubtless take it, I very much doubt that it will be a high-priority purchase for travelling birders, many of whom are capable of plugging the still significant gaps in our knowledge of Borneo's birds. Without this publication, he or she might be oblivious of the discoveries they could make, which would certainly be a shame.

Chris Bradshaw

Tennyson, A. & Martinson, P. 2007. *Extinct birds of New Zealand*. Te Papa Press, Wellington. 180 pages, maps, diagrams and numerous colour plates. NZ$64.99 (*c*.UK£25).

Although at first glance this book looks like an update of Gill & Martinson's similarly titled work from 1991, it is in a different class. Immediately noticeable is how much Martinson's artwork has improved, but the coffee-table format belies the enormous amount of information that Tennyson has condensed into the species descriptions, which unlike in the earlier work are very fully referenced. Each species is accompanied by a full-page colour painting, many of course speculative in colour, but based on the known osteology and set in typical habitat. The book's coverage includes the far-flung Kermadec and Chatham islands, and the subantarctic islands (Campbell etc.), with the Australian-owned islands (Norfolk, Macquarie) included on biogeographical grounds. An appendix lists known skins (not subfossils) of extinct New Zealand birds and where they are held.

There is much ongoing archaeology and palaeontology in New Zealand, reflected in the increasingly detailed dating of extinctions and descriptions of new species that feature here, though of course nothing is static, and Trevor Worthy has just described a 'new' Miocene pigeon. However the book's emphasis is on Holocene avifauna, and its disappearance in two distinct waves—Polynesians (Maori) brought Pacific Rats *Rattus exulans* from the late 13th century, and Europeans a suite of exotic predators from the late 1700s. The 'contribution' of each predator to extinctions is tabulated, the worst offender (after humans) being Pacific Rat, but perhaps only because it arrived before Eurasian rats, cats and mustelids. Feral pigs only 'possibly' played a role in bird extinctions—the score is different for reptiles. An unexpected extinction was Norfolk Island Triller *Lalage leucopygia*, exterminated in the 1970s by Ship Rats *R. rattus* which exploded after the local cats had been knocked out by distemper—a classic example of 'mesopredator release'.

That so much of New Zealand's fauna survives is partly due to the large number of offshore islands that escaped invasion by some or all exotic predators—but as in Madagascar, another large fragment of Gondwana where humans arrived remarkably late, the big 'stuff' went first—e.g. the moas hunted to extinction, depriving giant eagles of their prey. But so many species, especially on the outer islands, were flightless or nearly so, with the result that whatever their size they fell victim to rats and cats—Stephen's Island Wren *Traversia lyalli* being only the most famous example.

Published by New Zealand's national museum, the book is excellent value. I hope they will soon produce a counterpart for the other vertebrates that have suffered equally.

Anthony Cheke

REFEREES

I am grateful to the following, who have reviewed manuscripts submitted to the Bulletin during the last year (those who refereed more than one manuscript are denoted by an asterisk in parentheses): David Anderson, Phil Atkinson, Bas van Balen, Richard Banks (*), Bruce Beehler, Robert Bleiweiss, Jeremy Bird, Nik Borrow, Bill Bourne, Vincent Bretagnolle, Michael Brooke, Murray Bruce (*), Stuart Butchart, Terry Chesser, David Christie, Nigel Cleere, Nigel Collar, Charles T. Collins, Jared Diamond (*), Edward C. Dickinson (*), Paul Donald, Guy Dutson, Juan Freile, Steven Gregory, Kees Hazevoet, Steve Hilty, Mike Imber, Morton Isler, H. Lee Jones, Oliver Komar, Niels Krabbe (*), Mary LeCroy (*), Clive Mann, Martim Melo, David Medway, Storrs Olson, David Parkin, Fernando Pacheco, H. Douglas Pratt, Thane Pratt, Robert Prŷs-Jones, Pamela C. Rasmussen, Van Remsen, Richard Schodde (*), Raul Sedano, Thomas S. Schulenberg, Frank Steinheimer, Lars Svensson, Colin Trainor, David Wells, Kevin J. Zimmer and Francis Zino.—The Editor

Selection of a neotype for *Apteryx mantelli* Bartlett, 1852, with the support of genetic data

by Lara D. Shepherd, Joanne Cooper, James Haile, Paul Scofield, Alan J. D. Tennyson & Trevor H. Worthy

Received 30 September 2008

Summary.—Genetic studies in kiwis (*Apteryx* spp.) have led to a number of recent taxonomic changes, including the recognition of three species of brown kiwi. For one of these species, North Island Brown Kiwi *Apteryx mantelli* Bartlett, 1852, no holotype was originally nominated and the type series has remained unidentified. We searched for potential syntypes but were unsuccessful. Therefore, we designate a neotype that preserves the current usage of *A. mantelli* for extant North Island brown kiwi.

Studies of genetic variation in modern and ancient populations of New Zealand's Brown Kiwi *Apteryx australis* (Baker *et al.* 1995, Burbidge *et al.* 2003, Shepherd & Lambert 2008) have revealed distinct genetic groupings that are not completely congruent with traditional taxonomic schemes (e.g. Turbott 1990). These studies have led to a number of taxonomic changes, including the description of a new kiwi species, *Apteryx rowi* Tennyson *et al.*, 2003, from the west coast of New Zealand's South Island. Furthermore, it is now widely accepted that North Island Brown Kiwi *A. mantelli* Bartlett, 1852, is specifically distinct from South Island Brown Kiwi *A. australis* Shaw, 1813, and they are now usually listed as species as they were originally described (e.g., Holdaway *et al.* 2001, Tennyson *et al.* 2003, Robertson 2003).

Abraham Dee Bartlett (1812–97), a British taxidermist and natural history dealer who published papers on avian taxonomy, behavioural and avicultural matters (Anon. 1897) first recognised the distinctiveness of the brown kiwi from the North Island. When Bartlett described *Apteryx mantelli* at a meeting of the Zoological Society of London on 10 December 1850, he gave the imprecise locality of 'North Island' and, as was then common practice, did not nominate a holotype (Bartlett 1852). Bartlett specified his use of kiwi specimens from the collections of the British Museum, the Zoological Society and the Royal College of Surgeons, but gave no indication of the numbers of individuals involved, nor their specific identifications. None of these syntypes has since been located.

In the course of studies of genetic diversity in brown kiwis, complex phylogeographical patterns have been revealed (Baker *et al.* 1995, Burbidge *et al.* 2003, Shepherd & Lambert 2008) that make it necessary to clarify the biological entity to which the name *Apteryx mantelli* Bartlett, 1852, applies. Modern and ancient samples of brown kiwis from the North Island separate into several distinct genetic clades, including one now believed to be only extant in the South Island (Shepherd & Lambert 2008). It is not known to which of these the name *A. mantelli* Bartlett, 1852, should be associated, thus precluding any further taxonomic distinctions.

We set out to locate specimens in Bartlett's syntype series, and nominate a lectotype if appropriate. Measurements from two potential syntypes were compared with Bartlett's description but since none was a close match, a neotype is nominated that preserves the current usage of *Apteryx mantelli* for extant North Island Brown Kiwi.

Methods

Identification of potential syntypes

Using Bartlett's description, the collections in the Royal College of Surgeons and Natural History Museum in Tring, where the avian collections of the former British Museum and Zoological Society's museum are now housed, were searched for potential syntypes of *Apteryx mantelli* Bartlett, 1852, during 2005/06.

Results and designation of a neotype

No reliably traceable pre-1850 specimens of *Apteryx mantelli* appear to have survived in the collections of the Royal College of Surgeons, which now include only a small number of fluid-preserved, partial anatomical preparations (SurgiCat 2006), most of which are not identified beyond genus. Whilst further investigation may reveal some of this material to potentially hold syntype status for *A. mantelli*, given that they cannot be adequately compared to the description, it would be inappropriate to use any of them as a potential lectotype.

In his catalogue of birds in the British Museum, Gray (1844) listed only three specimens of *Apteryx australis*, two of which were subsequently re-identified as *A. mantelli*: BMNH 1838.5.12.102, presented by the Earl of Derby and BMNH 1842.5.17.2, presented by Miss Rebecca Stone. These two specimens are the only extant examples of *A. mantelli* in the NHM collections that pre-date Bartlett's 1850 research. No specimens of *A. australis* or *A. mantelli* were found amongst the collections received by the British Museum at the dispersal of the Zoological Society's museum in 1855.

DNA analysis of sequences obtained from the two BMNH specimens grouped them with previously published North Island Brown Kiwi DNA sequences (J. Haile and L. Shepherd unpubl.; GenBank accession nos. DG295829 and DQ295830). However, comparison of Bartlett's plate XXXI, depicting the right foot in mirror image (as is usual in lithography), with those of both specimens has revealed that neither is an exact match for the plate. Both are scutellated significantly further up the tarsus than is shown on the plate. Although BMNH 1838.5.12.102 matches Bartlett's original description in its dark plumage coloration, neither specimen is a close match to Bartlett's morphological measurements (Table 1). We therefore consider that both BMNH 1838.5.12.102 and BMNH 1842.5.17.2 are not sufficiently similar to Bartlett's description of *A. mantelli* to be considered syntypes. Owing to the poor preservation of the BMNH specimens we have decided not to nominate either of these specimens as the neotype and instead select the best-preserved specimen of this taxon for which DNA sequence data is available.

TABLE 1.
Comparison of measurements from Bartlett (1852) and *Apteryx mantelli* study skins. Bartlett's original measurements were given in inches; the millimetre equivalent is provided in brackets. Measurement methods follow Tennyson *et al.* (2003). - = data not available.

	Bartlett (1852)	BMNH 1838.5.12.102	BMNH 1842.5.17.2	OR.9375 (neotype)
Bill from forehead	6 in. (101.6)	109.0	119.3	127.2
Tarsus	2 ½ in. (69.8)	67.6	70.2	*c.*76
Middle toe and claw	3 ⅝ in. (63.5)	61.8	62.5	*c.*80
Bristle length	-	-	-	68.2
Bristle %	-	-	-	53.6
Scute count (right leg)	-	-	-	7

Apteryx mantelli Bartlett, 1852

Neotype.—Female skin, no. OR. 9375 of the collection of the Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand. Collected at Ohakune, North Island, New Zealand by L. Rowles on 17 August 1960 and presented to the museum by M. P. Scott. DNA sequences from this specimen strongly supported its placement within a clade comprising North Island Brown Kiwi (Haplotype 29 in Fig. 1 from Shepherd & Lambert 2008; GenBank accession nos. AY713368 and AY713335). Furthermore, the morphology of this specimen represents typical *A. mantelli* and has most of the characters originally described by Bartlett (1852) to distinguish his species from *A. australis*, apart from his scute count, which appears erroneous (see Tennyson *et al.* 2003). Distinguishing characters for all brown kiwis were presented in Tennyson *et al.* (2003).

Description of neotype.—Adult female of weight 51b 15 oz (2,690 g). Dried colours are as follows. Feathers: streaked brown and black lengthwise, with a rufous hue on the bird's back and flanks. Outer wing feathers: unbarred. Bill: horn. Legs and claws: dark brown. Plumage 'harsh' when stroked backwards. Elongate barbless regions at the wing feather bases. Measurements are given in Table 1.

Acknowledgements

We thank the Natural History Museum (Tring) for permission to sample the kiwi skins and Simon Chaplin for searching the collections of the Royal College of Surgeons of England. Robert Prŷs-Jones, Brian Gill and Leon Perrie provided helpful comments on the manuscript.

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Overlooked first record of Leach's Storm Petrel *Oceanodroma leucorhoa* for Colombia

Thomas M. Donegan, Paul Salaman & James Dean

Received 23 October 2008

SUMMARY.—We report the first record of Leach's Storm Petrel *Oceanodroma leucorhoa* for Colombia. The bird is a specimen, held in the Smithsonian Institution, Washington DC, collected 160 miles from the country's west coast in either late April or early May 1941. Analysis of the specimen suggests that it can be assigned to *O. l. chapmani.*

Leach's Storm Petrel *Oceanodroma leucorhoa* is a widespread and relatively well-known pelagic species, found in the Pacific Ocean with breeding populations on islands west of Mexico and Baja California. In the Pacific region, its taxonomy, whilst controversial, has been subject to considerable study (Ainley 1980, 1983, Bourne & Jehl 1982, Power & Ainley 1986, Penhallurick & Wink 2004).

Leach's Storm Petrel disperses south to equatorial regions after breeding and at this time individuals often undergo moult (Crossin 1974, Spear & Ainley 2007). There are a handful of records of *O. leucorhoa* from Costa Rica (Slud 1979) and the Galápagos (Harris 1973). Harrison (1983) stated that the 'limits of southwards dispersal [are] not known but probably S to Peru' but did not show the species occurring in South American waters in his distribution map. Pitman (1986) and Erize *et al.*'s (2006) distribution maps show the species to occur broadly across Colombian Pacific waters, Spear & Ainley (2007) list the distribution of dark-rumped *O. leucorhoa* as far south as 10°S and Hilty & Brown (1986) considered that it 'should be found' in the Colombian Pacific. However, there are no previous published Colombian records (Salaman *et al.* 2008). The larger Markham's Storm Petrel *O. markhami* and Black Storm Petrel *O. melania* have similar plumage to the dark-rumped races of *O. leu-*

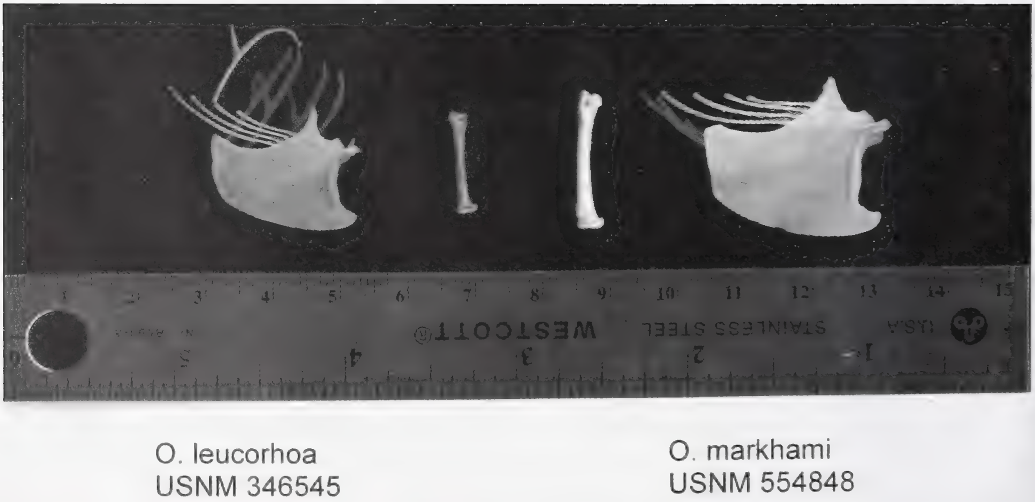

Figure 1. Skeletons of Colombian Leach's Storm Petrel *Oceanodroma leucorhoa chapmani* (USNM 346545, left) and larger Markham's Storm Petrel *O. markhami* (USNM 554848, right) (James Dean)

corhoa, posing a field identification challenge and meaning that *O. leucorhoa* may have been overlooked in the Colombian Pacific.

Project BioMap (http://www.biomap.net) compiled and verified 230,000 records of Colombian bird specimens from 87 collections across the world. Details of a trunk skeleton and study skin prepared from the same specimen labelled Swinhoe's Storm Petrel *O. monorhis socorroensis* and housed at the Smithsonian Institution (USNM 368053 study skin / 346545 partial skeleton) were copied into the BioMap database from the USNM database, but logged onto the database as *O. leucorhoa socorroensis*. Subsequent examination of the study skin and consultation with S. N. G. Howell lead us to consider the specimen to be of *0.l. chapmani* and not *socorroensis* as originally labelled.

The specimen is a male, collected '160 miles off the west coast of Colombia' (04°40'N, 80°08'W) by Carl Ecklund (field no. 85). The USNM catalogue shows the specimen to have been collected late April or early May 1941. The words 'U.S. Antarctic Service' appear on the label. No further details are available and no field notes were deposited at USNM. Friedman (1945) published details of birds recorded during this expedition including specimens collected by Ecklund but did not mention the Colombian *Oceanodroma*. Ecklund published several leading papers on the ecology of southern seabirds (e.g. Ecklund & Charlton 1959, Ecklund 1961) giving us no reason to doubt that the record is genuine.

The USNM *Oceanodroma* skin is somewhat bedraggled and the tail is in heavy moult. Measurements are as follows: wing chord: 150 mm, tail length (to tip of longest feather): 76 mm; tarsus length: 22.9 mm; culmen: 15.8 mm; bill depth at base 5.2 mm; bill depth at gonys 4.5 mm. These measurements all fall within the range for *0. l. chapmani* (Ainley 1980). The culmen length is larger than that known for any *0. l. socorroensis* (Ainley 1980) and other measurements are close to the maximum recorded for that subspecies, strongly suggesting that *0. l. chapmani* is the subspecies involved.

The Colombian specimen can be separated from the possible confusion species *O. monorhis* by the absence of pale markings on the primary shafts and due to the latter's deeper and shorter bill (bill depth at base 6.5–7.0 mm, depth at gonys 5 mm for *O. monorhis* measured at USNM: see Fig. 2). Compared to the other possible confusion species, *O. markhami* and *O. melania*, the Colombian specimen is smaller, has a less deeply forked tail (although tail moult in the Colombian specimen means this is not definitive) and differs in the shade of grey in its plumage (Fig. 3). Compared to *O. melania*, the Colombian specimen also has a shorter tarsus.

The USNM specimen represents the only record of which we are aware of Leach's Storm Petrel for Colombia. It is surprising that the specimen has previously been overlooked (or no attention has been drawn to it) in the considerable literature relating to the species. The collection locality, 160 miles west of Colombia, falls within the 200 nautical miles standard limit set by checklist authorities dealing with the region (Remsen *et al.* 2009) meaning that the species can be added to the Colombian list.

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We thank all Project BioMap staff and museum curators, particularly Juan Carlos Verhelst, Diana Arzuza, Andrea Morales, Clara I. Bohórquez, Nigel Cleere, Sussy de la Zerda, Loreta Rosselli, David Caro and Robert Prŷs-Jones. Project BioMap was funded by the Darwin Initiative UK–DEFRA, Conservation International, The Natural History Museum (UK), American Museum of Natural History, Academy of Natural Sciences of Philadelphia and other institutions. We also thank Steve N. G. Howell for his very helpful review comments, particularly on subspecies identification.

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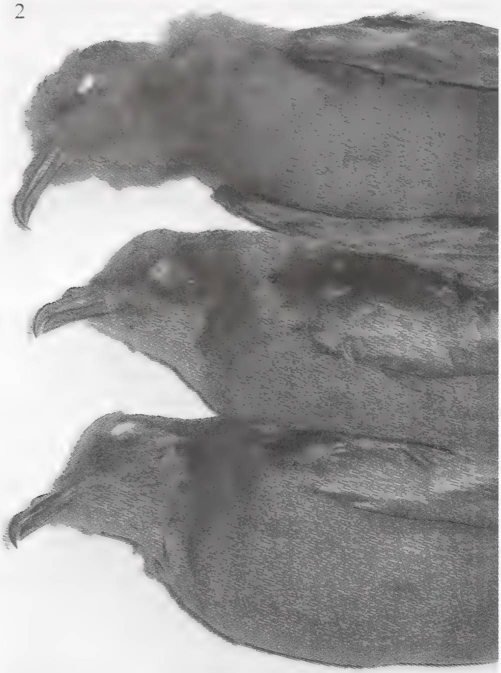

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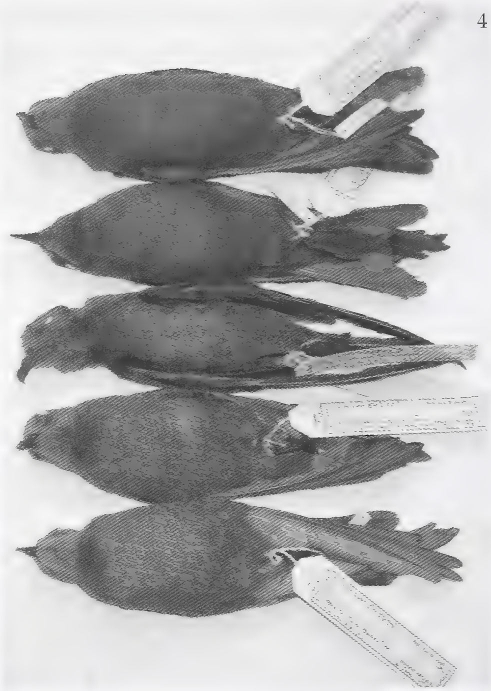

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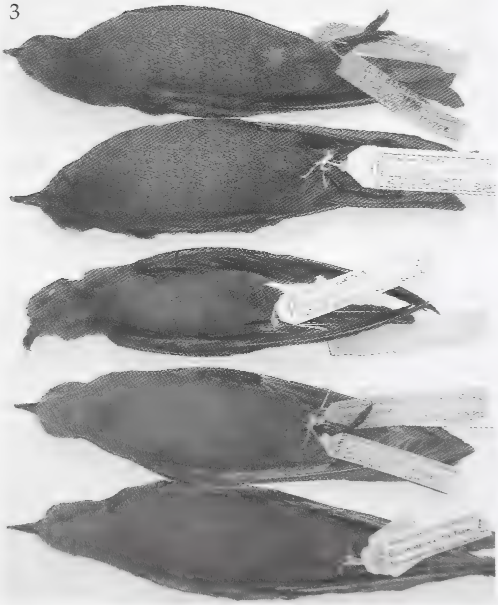
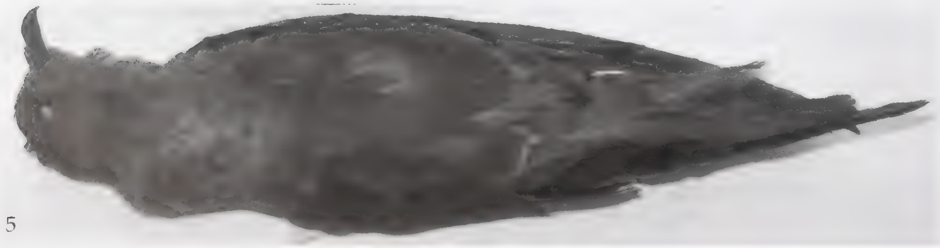


Figure 2. Leach's Storm Petrel *Oceanodroma leucorhoa chapmani* (USNM 368053; top) with two Swinhoe's Storm Petrels *O. monorhis* (USNM 552200; middle, and USNM 552201; bottom), both from ex-USSR localities in the western Pacific, showing differences in bill depth and length (James Dean)

Figure 3. Two Black Storm Petrels *Oceanodroma melania* from Isla San Benito, Baja California, Mexico (top: USNM 153958 and USNM 543591); with Colombian Leach's Storm Petrel *O. leucorhoa chapmani* specimen (centre: USNM 368053); and two Markham's Storm Petrels *O. markhami* (bottom: USNM 364914 from Peru, 200 miles west of Callao; USNM 277919 Peru, at sea off Lagarto Head) (James Dean)

Figure 4. Two Leach's Storm Petrels *Oceanodroma leucorhoa chapmani* (top: USNM543524 and USNM 543522; both Isla San Benito, Baja California); the Colombian *O. l. chapmani* specimen (centre: USNM 368053); and the paler-bellied *O. l. socorroensis* (bottom: USNM 543675 and USNM 543644; both Isla Guadelupe, Baja California, Mexico) (James Dean)

Figure 5. Dorsal view of Colombian *Oceanodroma leucorhoa chapmani* specimen (USNM 368053) (James Dean)



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A second specimen of Sabine's Gull *Xema sabini* from Texas, with a review of Meinertzhagen-generated confusion surrounding the first

by Robert Prŷs-Jones, Daniel M. Brooks & Keith A. Arnold

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Summary.—We document the first voucher specimen of Sabine's Gull *Xema sabini* from the upper Texas coast of the Gulf of Mexico, salvaged on 25 August 2007 from Surfside Beach, Brazoria County. We also present evidence pointing to a case of fraud by Richard Meinertzhagen concerning the first Texas specimen of Sabine's Gull, taken on 4 October 1889 at Corpus Christi, Nueces County.

Herein we document the first voucher specimen of Sabine's Gull *Xema sabini* from the upper Texas coast of the Gulf of Mexico. The female specimen (HMNS.VO 2055) from Surfside Beach (Brazoria County) is housed at the Houston Museum of Natural Science (HMNS), Vertebrate Ornithology (VO) division. It was salvaged by D. Simon on 25 August 2007, having apparently died of an undiagnosed illness, and was prepared as a study skin by T. McSweeny in July 2008 (Fig. 1). The non-breeding plumaged specimen weighed 203 g, had no trace of fat, an ovary 10 mm in diameter containing individual ovules 2.5 mm in diameter, and a wholly ossified skull.

Sabine's Gull was removed from the Texas review list at the Texas Bird Records Committee (TBRC) annual meeting in November 1999. Prior to that time there was only a single known specimen from the state (from Nueces County, lower Texas coast), along with 31 records documented with photographic evidence; however, none of these was from the upper Texas coast. Two records submitted to the TBRC but not accepted were from Galveston (1988) and Chambers (Peterson 1967) Counties. This second Sabine's Gull specimen therefore provides an important addition to our knowledge of the species' status in Texas. Moreover, this is the fourth species of pelagic bird to be documented as the first voucher specimen from the upper Texas coast from the HMNS VO collections; the first three were Parasitic Jaeger *Stercorarius parasiticus*, Band-rumped Storm Petrel *Oceanodroma castro* and Leach's Storm Petrel *O. leucorhoa* (Brooks & Arnold 2003).

The first Texas specimen of Sabine's Gull was an adult male taken on 4 October 1889 at Corpus Christi, Nueces County, by F. B. Armstrong, working on behalf of the English ornithologists F. D. Godman and O. Salvin. Godman and Salvin donated their enormous bird collection to the British Museum (Natural History, BMNH), and in 1891 their Texan Sabine's Gull was registered into the BMNH as specimen 1891.10.30.53 (as noted, with associated specimen data, contemporaneously in BMNH register AV42, p. 165) and its collection details subsequently published in Saunders (1896). However, no proper write-up of Armstrong's substantial southern Texas collection appeared (Griscom & Crosby 1925–26), and American ornithologists remained largely unaware of the existence of a Sabine's Gull specimen from the state; indeed, the first published American reference may not have been until Ridgway (1919: 664) noted a specimen from the 'coast of Texas (Corpus Christi, Oct.)'. Cottam *et al.* (1975: 135) later gave fuller data, correctly recording 'one adult male collected 4 October 1889 by F. B. Armstrong at Corpus Christi (Nueces County)', but knowledge of its whereabouts was clearly not widespread given that the second edition of the Texas checklist (TOS 1984) could only list it as 'specimen not located (shown in Oberholser 1974)'.

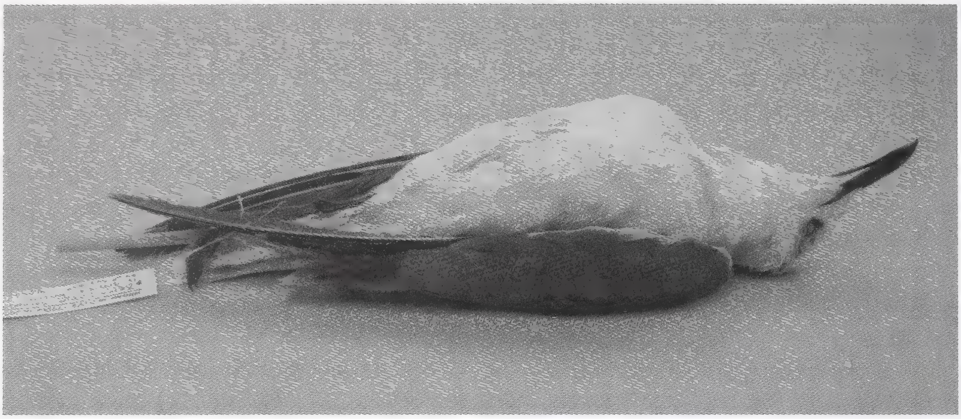
Subsequently, however, Rappole & Blacklock (1985) published the registration number 1965.M.4079 for the specimen, based on information provided by the BMNH.

The breeding plumage specimen 1965.M.4079 is indeed now the only Texan Sabine's Gull in the BMNH collection and has been since at least before the mid 1970s (see below). It was acquired by the BMNH in the 1950s with the huge Meinertzhagen collection and bears three labels: one, clearly the collector's label though lacking the name of the person involved, states in pencil on one side only 'C Christi, Texas, Oct 4–89, ?'; the second is the Meinertzhagen label with similar data, but with '(J. Dwight)' recorded on its reverse; the third is the BMNH label (Fig. 2). A bracketed name on the reverse of a label is the standard way Meinertzhagen indicated the institution or individual involved when he acquired a specimen by gift or exchange and, again typically, Dwight's name is also noted against the appropriate specimen entry in Meinertzhagen's own register (now also held by the BMNH). 'J. Dwight' refers to the well-known American ornithologist and gull expert Jonathan Dwight, who died in 1929 and whose large collection is now in the American Museum of Natural History, New York (Lanyon 1995).

There is thus a seeming paradox, with two BMNH specimens of Sabine's Gull, 1891.10.30.53 and 1965.M.4079, having the same date and Texas locality data but different collector and collection origins, and with seemingly only the latter now extant. The possibility of two separate Sabine's Gulls being collected on the same day, 4 October 1889, in Corpus Christi, but only one ever having been publicised, strains credulity. Moreover, the collector's label on the Meinertzhagen specimen is totally characteristic, in both style and handwriting, of those used by Armstrong on other specimens he obtained for Salvin and Godman, as was first noted over 30 years ago. On 21 July 1976, John Rappole wrote to the BMNH asking for information on an enclosed list of South Texan bird specimens, including Sabine's Gull, 'reputedly collected by Armstrong' for Salvin and Godman. In reply on 19 August 1976, the former curator, Derek Read, confirmed the presence only of the Meinertzhagen Sabine's Gull specimen 1965.M.4079, but noted 'However, a small label has the locality and date, without collector, written in pencil, and agrees in every way with the labels I have found on the other Armstrong specimens. I have assumed, therefore, that this is also one of his specimens.' (BMNH Library Archives, Tring) Independently of this, when re-curating the BMNH gull collection another former curator, Michael Walters, recorded that 'I am suspicious of this skin, Meinertzhagen seems to be only authority that Dwight was actually the collector' (notes dated 14 February 1986).

The style of preparation of 1965.M.4079 is characteristic of Armstrong, who produced beautiful, de-fatted skins, with the body cavity generously stuffed and carefully closed, wings and legs precisely aligned (latter crossed), and the beak normally pointing straight back so that the skull rests on the surface when the bird is laid on its back (six BMNH Armstrong skins of Laughing Gull *Larus atricilla*, Ring-billed Gull *L. delawarensis* and Bonaparte's Gull *L. philadelphia* examined). Even by Armstrong's high standards, however, and in comparison to all other BMNH *X. sabini*, the specimen's plumage is quite exceptionally clean (Fig. 3).

Since the first published accusation by Clancey (1984), it has become increasingly clear that Richard Meinertzhagen stole and relabelled numerous birds in his collection, with many being taken from the BMNH (e.g. Knox 1993, Rasmussen & Prŷs-Jones 2003). He prided himself on the high quality of his specimens and is known to have cleaned and or remade other important specimens he stole (e.g. see Rasmussen & Collar 1999, Kennerley & Prŷs-Jones 2006). It therefore seems almost certain that specimen 1965.M.4079 is in fact the missing 1891.10.30.53, but with the Salvin and Godman label replaced by a Meinertzhagen one that implies the latter obtained it from Dwight who, interestingly, did have a large col-



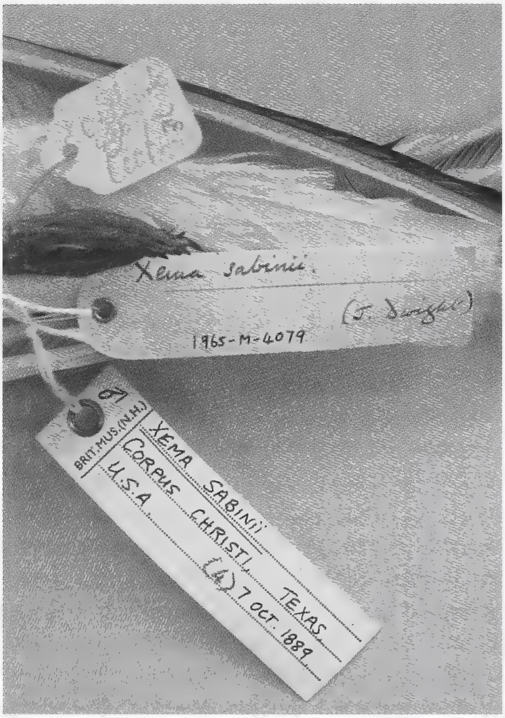
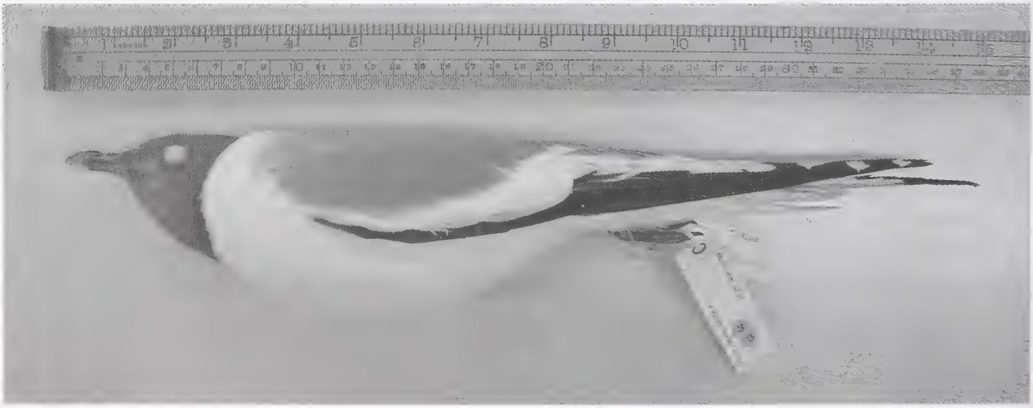

Xema sabinii.
(J. Dwight)
1965-M-4079
67
BRIT. MUS. (N.H.)
XEMA SABINII
CORPUS CHRISTI, TEXAS
U.S.A. (♂) 7 OCT. 1889

Figure 1 (above). First voucher specimen (HMNS.VO 2055) of a Sabine's Gull *Xema sabini* from the upper Texas coast of the Gulf of Mexico, USA (Beth Copeland)

Figure 2 (left). Current labels of Sabine's Gull *Xema sabini* specimen BMNH 1965.M.4079 (actually BMNH 1891.10.30.53—see text) (© Natural History Museum)

Figure 3 (below). First voucher specimen (BMNH 1891.10.30.53) of a Sabine's Gull *Xema sabini* from the state of Texas, USA (© Natural History Museum)



lection of skins from southern Texas collected for him by A. P. Smith, but not until between 1908 and 1912 (Griscom & Crosby 1925–26). Despite the lack of a collector's name, it is nevertheless puzzling why Meinertzhagen retained the original collector's label and collection details in this instance although, as with some other important specimens he stole, e.g. the Forest Owlet *Athene blewitti* (Rasmussen & Collar 1999), Meinertzhagen appears never to have publicised that his collection contained this rarity.

Acknowledgements

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Notes on early illustrations and the juvenile plumage of the extinct Hawaii Mamo *Drepanis pacifica* (Drepanidini)

by Storrs L. Olson & Julian P. Hume

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SUMMARY.—The earliest published illustrations of the extinct Hawaii Mamo *Drepanis pacifica* are probably all based on one or two adult specimens originating during Cook's third voyage and the variation between them does not reflect variation in plumage. Two unremarked specimens of Hawaii Mamo in the Paris Museum are in a transitional plumage showing that this species had a previously unknown juvenile plumage in which the black feathers of the adult were dark brown. This fact has further implications for the plumage sequence of other species of the black-and-red clade of Drepanidini.

The brilliant black-and-yellow Hawaii Mamo *Drepanis pacifica* was of cultural significance to native Hawaiians for making their feather artefacts (Brigham 1899), but the species is now extinct and is among the rarest of Hawaiian birds in museum collections. Only 11 specimens survive (Banko 1979), from four known sources: Cook's third voyage in 1779 (Medway 1981, Olson 1989), the private collector James Mills of Hilo who flourished in the 1860s (Manning 1978), Théodore Bailleu about 1876 (see below) and Henry Palmer for whom the last specimen was obtained in 1892 (Rothschild 1893–1900). Until now, only adult specimens were thought to exist and no sex or age differences were known (Pratt 2002, 2005). Here we supply overlooked evidence for a distinct brown juvenile plumage of the Hawaii Mamo.

The earliest specimens and their illustrations

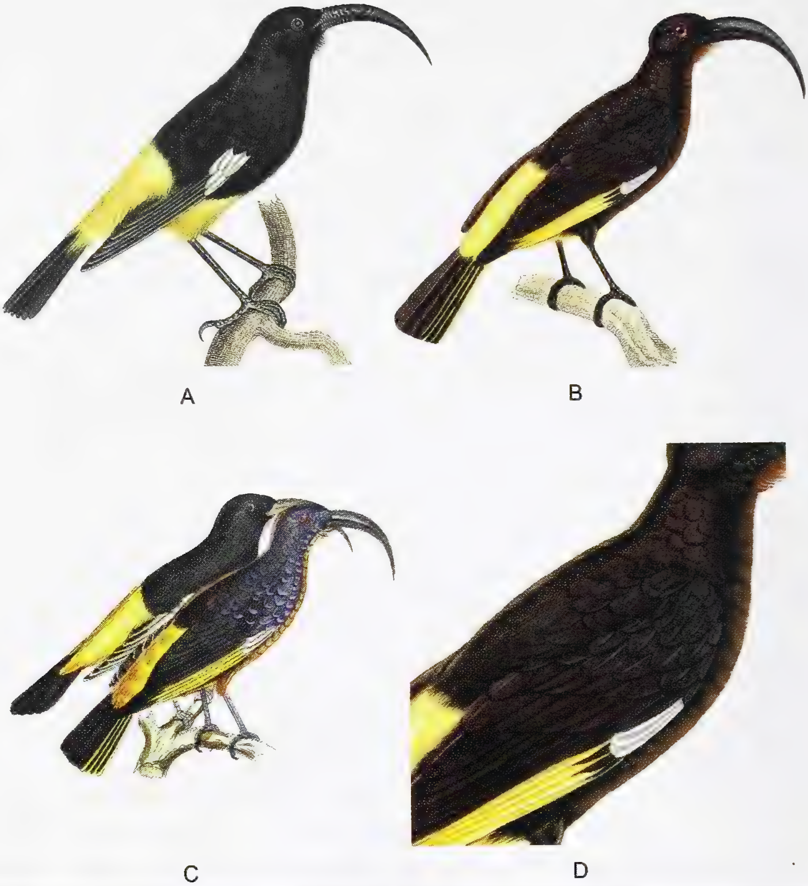
Our discovery of the juvenile plumage of *Drepanis pacifica* led us to examine the earliest published illustrations of the species because we were aware that one of the two individuals illustrated by Reichenbach (1853: pl. DLXI, figs. 3828–3829) was shown with a distinctly brownish throat and belly, and a line of brownish along the dorsum (Fig. 1C), as opposed to the other specimen in which the dark parts of the plumage were entirely black.

The Hawaii Mamo was first obtained on Cook's third voyage in 1779 (Medway 1981). Cook voyage artists William Ellis and John Webber each depicted the species and their paintings still survive at The Natural History Museum, London (Lysaght 1959). Whether these were made from live birds or extant specimens is unknown. The species was first described (but not illustrated, *contra* Jackson 1998) by Latham (1782) who called it the 'Great Hook-billed Creeper' and attributed it to the 'Friendly Islands' (Tonga). Latham's description was the basis for Gmelin's (1788) binomial *Certhia pacfica*, which eventually became the type species of Temminck's (1820) generic name *Drepanis*. Latham (1787) later corrected the locality to 'Owhyhee' (Hawaii) and stated that its local name was 'hoohoo'. The specimens that Latham saw were then in the collection of Sir Ashton Lever and while still in his possession one of them was illustrated by Sarah Stone (Walters 2004). That painting, now also in The Natural History Museum, was reproduced in Jackson (1998).

Citing both Latham and Gmelin, abbreviating the name to 'Hoho' and giving the locality as 'Owhihee', Audebert & Vieillot (1802: 124, pl. 63) published the first illustration of the species (Fig. 1A) from an 'individu nous a été communiqué par M. Parkinson' that formed part of Parkinson's collection and that had been drawn by 'Syd.[enham] Edwards.' Their description could have been taken from Latham and from Edward's drawing, although it is possible that Vieillot once had the actual specimen in hand. Edwards was a well-known draughtsman of natural history, particularly botany (DNB 1921–22, vol. 6). James Parkinson was a museum proprietor who won the collection of Sir Ashton Lever in a lottery in 1784. Parkinson's collection was then auctioned in 1806 (DNB 1921–22, vol. 15, King 1996). The museum in Vienna bought two specimens of *Drepanis pacifica* at that time (Medway 1981), one of which (MCZ 236875), lacking the upper half of the bill, was later exchanged with the American Museum of Natural History and thence went to the Museum of Comparative Zoology at Harvard University (Bangs 1930, Olson 1989). The intact specimen remaining in Vienna (NMW 50735) had probably served as model for Audebert & Vieillot's plate. They described the underparts as being blackish brown ('brun noirâtre'). We examined the specimen and found it to be an adult with typically blackish underparts, perhaps slightly brownish but definitely not brown such as in the juvenile plumage we describe here.

The species was next illustrated (Fig. 1B) five years later by Levaillant (1807: 45, pl. 19) under the name 'Mérops jaunoir', of which he said: 'I have seen only a single individual of this species, which is part of my collection. Viellot [*sic*] has described one, of which he received a sketch from London, under the name of Hàho [*sic*], which we can retain as it likely has some connection with its cry or singing. This bird lives in New Holland [=Australia]' (our translation). A label annotation (probably from the early 19th century) on the Vienna specimen of *Drepanis pacifica* states that the only other specimen of the species was in the Leiden museum, possibly received from Levaillant. Levaillant was closely associated with C. J. Temminck of the Leiden museum (Stresemann 1975) and Temminck's father was already exchanging material with Levaillant prior to 1820. Those specimens became part of the son's private collection, which was subsequently donated to Leiden (Hoek Ostende *et al*. 1997). Regardless, the Leiden specimen of *Drepanis* (RMNH 110.030) was not acquired until 1819 at the sale of William Bullock's museum (Medway 1981), long after Levaillant's publication. Although Medway (1979: 126) originally believed that specimen to have come from Cook's third voyage, he later stated that there was no evidence to support his earlier proposition given that Bullock's specimens 'could have been obtained on any one of the voyages (at least of English ships) which visited the Hawaiian Islands after Cook but before Bullock's sale in 1819.' Whereas that statement might be true for the Hawaiian Islands as a group, most vessels called only at Honolulu on Oahu and very few troubled to preserve specimens of birds. No records exist of anyone who returned with specimens of birds from the island of Hawaii between Cook's voyage and 1825 (Olson & James 1994). Thus Cook's voyage is as yet the only known source for any specimen of Hawaii Island endemic such as *Drepanis pacifica*, the Hawaii 'O'o *Moho nobilis* or the Akialoa *Hemignathus obscurus* (s.s.) that were documented as being in collections prior to 1819 or even somewhat later. The Leiden *Drepanis* is mummified, as are the two specimens known to be from Cook's voyage, and as were many, but apparently not all, Cook voyage specimens (Rothschild 1893–1900, Steinheimer 2006).

Levaillant's mention of Vieillot is clearly a reference to Audebert & Vieillot (1802), as the latter continued the work after Audebert's death in 1800. Levaillant must have known, therefore, that his 'Mérops jaunoir' did not come from Australia. No existing specimen of *Drepanis pacifica* can be identified as ever having been in the possession of Levaillant or labelled as being from Australia (most of Levaillant's collections went to Leiden and Paris). We strongly suspect that he based his illustration on Audebert & Vieillot (1802) and made up his own name and origin for the species. Levaillant was a 'fanatical defender' (Stresemann 1975: 94) of Buffonian procedure in eschewing the Linnean binomials that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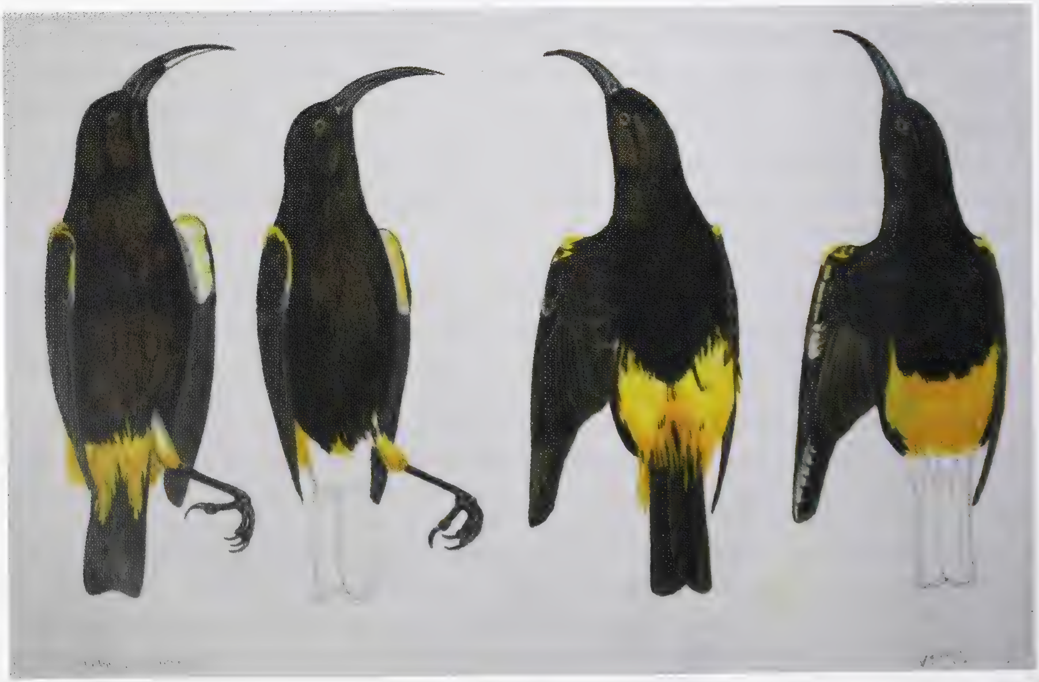

were Vieillot's stock and trade. Copying the *Drepanis* and giving it his own name and history would have enhanced his reputation for depicting 'colorful and bizarre birds from all over the world, not merely from Africa' that sold the books from which he made his living (Stresemann 1975: 90).

The overall impression of Levaillant's plate (Fig. 1B) is that the dark parts of the plumage are black and only by very close inspection (Fig. 1D) can one detect a brownish tinge along the line of the underparts and dorsum. We believe the brown edge is an artefact either of the colourist's technique or of the pigment and may have been an attempt to provide highlights. It might also have been an attempt to recreate the 'brun noirâtre' underparts described by Audebert & Vieillot (1802).

The small figures in Reichenbach (Fig. 1C) were copied from Levaillant (foreground) and Audebert & Vieillot (background) and in the former the brown areas, as well as the shading in the black areas, have been greatly exaggerated. If we assume that Levaillant's figure is a copy, then it is possible that all of these figures were based on the single specimen now in Vienna, which is an adult without any of the truly brown juvenile plumage we now describe.

The juvenile plumage

Remains of what we interpret to be the juvenile plumage are preserved in two specimens of *Drepanis pacifica* in the Muséum National d'Histoire Naturelle, Paris, that apparently were never examined or described by anyone who has written about the species. They were collected by Théodore Ballieu (not Bailleu as often misspelled—see Mearns & Mearns 1992) in the vicinity of 'Dr. Trousseau's mountain-cottage in the district of Kona on Hawaii' (Wilson & Evans 1890–99: 89, footnote). Banko (1981: 167) believed they were collected *c.*1876 at Pulehua (*sic* = Pu'ulehua) Ranch, a well-known collecting locality on the leeward slopes of Mauna Loa (*cf.* Olson 1999). The specimens are unstuffed skins and are mangled and twisted so that colour distribution is difficult to determine. Here we provide descriptions of the plumage of both specimens (Fig. 2).

Drepanis pacifica MNHN V399 unsexed, lacking the anterior half of the mandible. Forehead to top of crown black, grading into brown on nape; brownish black on upper back grading to black on lower back. Yellow feathers of lower back pale lemon-yellow interspersed with black feathers, central and lower regions deep yellow. Upper surface of tail dark brownish black. Sides of head brown, superciliary blackish brown, cheeks brown, darker at top; throat black, sides of neck blackish brown, breast hazel-brown, sides of body blackish brown/black. Belly hazel-brown, edged laterally with black. Undertail-coverts deep yellow, undertail greyish brown. Surface of upper wing blackish brown, secondaries brown, primaries blackish grey-brown. Primary-coverts dark, one off-white; shoulder deep

Legend to figures on facing page

Figure 1 (top). The three earliest depictions of the Hawaii Mamo *Drepanis pacifica*: (A) Audebert & Vieillot (1802); (B) Levaillant (1807), possibly copied from A; (C) Reichenbach (1853), which was taken from A (in back) and B (foreground)—the figure is reversed here to facilitate comparison and in the original was much smaller than A or B; (D) detail of B showing brownish pigment along edge of breast and dorsum that was greatly exaggerated in C. It is possible that all of these figures may ultimately have been based on the adult specimen in Vienna (NMW 50735).

Figure 2 (bottom). Acrylic paintings of the two specimens of Hawaii Mamo *Drepanis pacifica* in the Paris museum that retain brown feathers from the juvenile plumage: (left and second from right) MNHN V399 unsexed, lacking the anterior half of mandible (the right leg was not figured to show more of the undertail-coverts, but is present in the specimen); (right and second from left) MNHN V398, unsexed, lacking right leg and tail (Julian P. Hume).

yellow, interspersed with black; underwing off-white, pale yellow on edge; primaries and secondaries greyish brown. Thighs off-white at base grading to deep yellow. Bill paler at base.

Drepanis pacifica MNHN V398, unsexed, lacking right leg and tail. Forehead and nape to back black, with a hint of blackish brown on sides. Yellow feathers of lower back almost uniform deep yellow, with lemon-yellow feathers on sides. Cheeks brown, blackish brown at top, throat black grading to blackish hazel-brown on belly, darker on sides. Upper wings blackish brown, secondaries brown with pale brown edges, primaries dark brown with pale greyish-brown edges, particularly at the tips. Primary-coverts off-white, with pale yellow centres at base; shoulder deep yellow, interspersed with black feathers; underwing off-white with deep yellow edges. Under surface of primaries and secondaries greyish brown. Thighs off-white, becoming deep yellow distally, interspersed at base with brown feathers. Bill paler at base.

Unfortunately, these specimens lack dates of collection, which would have provided some clue as to the species' breeding season. The differences between them suggest that V398 is more mature than V399. Brown feathers are much more extensive in V398, particularly on the head, neck and underparts. In both, the development of adult black feathers appears first on the back, forehead, throat and sides of body, and where black feathers appear through the brown, they are black only at the tips, and brown at the base. The yellow feathers of the lower back are almost uniform deep yellow in V398, more lemon-yellow and interspersed with dark feathers in V399. There is greater colour development on the primary-coverts in V398, and the coverts along the outer edge of the 'wrist' have deep yellow, rather than pale yellow edges. The primaries in V398 have pale greyish-brown edges, and the secondaries light brown edges, whereas in V399 they are almost uniformly blackish brown. The legs are larger in V399 and the bill and wings longer in total length, but the thighs are more extensively deep yellow in V398.

A distinct juvenile plumage was probably characteristic of all species of the black-and-red clade of Drepanidini, as recognised by Perkins (1903) and all recent phylogenies (reviewed by Pratt 2005). The juvenile plumage of 'Apapane *Himatione sanguinea* is largely brownish, and the body feathers in the first prebasic moult go directly to the red adult plumage (Fancy *et al*. 1993, Fancy & Ralph 1997). In the 'I'iwi *Vestiaria coccinea*, the juvenile body feathers are greenish, fading to yellow, with black tips, but likewise change to the adult scarlet colour in the first prebasic moult (Fancy *et al*. 1993, Fancy & Ralph 1998). Both species retain the juvenile primaries and most or all of the secondaries after the first prebasic moult. Such appears to have been the case in *Drepanis pacifica* as well, as the decidedly brown secondaries in the specimens described above appear to be juvenile. We interpret the brown contour feathers in those specimens also to be remnants of juvenile plumage. The specimens are too advanced in their state of moult to know how to interpret the appearance

TABLE 1
Measurements of the two specimens of Hawaii Mamo *Drepanis pacifica* with partial juvenile plumage.

Measurement (mm)	MNHNV398	MNHNV399
Total length	140	140
Anterior edge of nostril to tip	36.6	38.6
Exposed culmen	41	43.4
Wing-length (chord)	96	97.4
Tail-length	–	53.4
Tarsus	29	33.4

of the fresh juvenile plumage, but it possibly was entirely cryptic and may have lacked the yellow rump and undertail feathers so as not to signal adult social status.

The discovery of a brown juvenile plumage in *Drepanis pacifica* provides insight into the confusing plumages of an even less well known Hawaiian honeycreeper, the extinct Ula-'ai-hawane *Ciridops anna*. Three plumages are evident in the five existing unsexed specimens (one of which is not usable for colour comparisons—Olson 1992: 445): a scarlet, black and grey plumage, presumably adult (two specimens); a mostly green, grey and brown specimen in fresh, unworn, hard plumage with no sign of juvenile fluffiness or pointed rectrices; and a mostly red-and-black specimen with much brown intermingled (Pratt 2002, 2005). We believe this 'transitional' specimen shows the remnants of a brown juvenile male plumage. Thus the single green-plumaged specimen is probably the adult female and not the immature as believed by Pratt (2005). If so, the 'Ula-'ai-hawane would be unique amongst the red-and-black clade in being highly sexually dichromatic.

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The occurrence of São Tomé Short-tail *Amaurocichla bocagii* and Newton's Fiscal *Lanius newtoni* in the montane forests of São Tomé

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SUMMARY.—The globally threatened São Tomé Short-tail *Amaurocichla bocagii* and Newton's Fiscal *Lanius newtoni*, both of which are endemic to São Tomé in the Gulf of Guinea, have been considered to be mostly confined to low-elevation forests. A playback survey in the island's central massif found three (possibly four) family groups of short-tail and a single fiscal along a 4-km trail above 1,300 m. At least the short-tail appears able to use, and breed in, montane forests, extending the possible Area of Occupation of this Vulnerable species.

The island of São Tomé in the Gulf of Guinea holds at least 17 species of single-island endemic birds, plus two shared with the nearby island of Príncipe and another shared with Príncipe and Annobón (Melo 2007, Melo & Jones in press). Several of the São Tomé endemics are of conservation concern, making the island one of the most important Endemic Bird Areas in tropical Africa (Stattersfield *et al.* 1998).

Most threatened endemics, including the globally Vulnerable São Tomé Short-tail *Amaurocichla bocagii* and the Critically Endangered Newton's Fiscal *Lanius newtoni*, are still poorly known, and systematic data on their habitat use and altitudinal range are still lacking. Jones & Tye (2006) set an altitudinal limit for *A. bocagii* at 500 m, despite that Dallimer *et al.* (2003) recorded one bird at 1,100 m, near Estação Souza, in the island's central montane massif. Newton's Fiscal *Lanius newtoni* has been collected at up to 1,060 m (Jones & Tye 2006), although most recent records come from lower areas (Schollaert & Willem 2001). Both species were also found in higher parts of the central massif by Olmos & Turshak (2007) and Rocha (2008), but without further details.

Following sightings of both species at Estação Souza by one of us (ACA), we decided to assess if short-tails and fiscals are regularly found in the montane forests of the Pico São Tomé or if previous records referred to transient individuals.

Methods

We undertook a playback survey on 16–17 August 2008 along the trail to Pico de São Tomé, in the central mountains of São Tomé. This trail runs along the north-facing slope of a steep forested valley with a stream at its bottom, and traverses the small plateau at Estação Souza, where both species had been recorded previously. Although the trail intersects some drainage lines, most of the heavy rainfall is quickly absorbed by the volcanic soil.

The area is cloaked by montane forest, commonly wrapped in mist, growing on steep ground, except for small occasional plateaux. The closed canopy reaches over 25 m and branches and trunks are densely covered in epiphytic lichens, mosses, ferns and orchids. The understorey is in places dense, with tree ferns such as the endemic *Cyathea welwitschii*, giant gingers *Renealmia grandiflora* and *Costus giganteus*, and the giant begonias *Begonia baccata* and *B. crateris*, amongst others.

Typical trees include *Trichilia grandifolia*, *Pauridiantha insularis*, *Pavetta monticola*, large figs such as *Ficus chlamydocarpa* and *F. kamerunensis*, *Croton stelluliferus*, *Erytrococca molleri*, *Homalium henriquensii* and the white-flowered *Tabernaemontana stenosiphon*. The South American tree *Cinchona quina* has invaded many areas. These forests were largely spared large-scale disturbance by man because of the rugged topography and wet climate (Jones & Tye 2006, Vaz & Oliveira 2007).

A 4 km-stretch of trail, including Estação Souza, was flagged at roughly 200-m intervals. At each point we played the songs of the short-tail and fiscal (from Chappuis 2001) using a MP3 player equipped with a small amplifier during the morning and afternoon of 16–17 August. At each point we recorded the number of individuals of the survey species responding vocally or seen, as well as simple habitat descriptors: altitude (m), litter cover (%), canopy cover (%), terrain (slope, plateau and ridge) and distance to water (m). Canopy and litter cover were estimated using sighting tubes with crosshairs and quadrats (Elzinga *et al*. 2001).

Results and Discussion

Short-tails were detected at ten of the 18 survey points, being readily attracted and responding to playback. At five of these points, birds were detected only in the morning, three only during the afternoon and two in both periods. Totals of 29 short-tails and one fiscal were registered along the 4-km stretch surveyed using playback (Table 1). A single fiscal was heard at Point 14, whilst up to seven and nine individual short-tails were detected around a single playback point (Table 1). These latter probably refer to points at the edge of territories between two or more family groups, as some of the birds seen were clearly juvenile, having shorter bills and a yellowish gape. At least one of these young was observed foraging for itself, suggesting that nesting had occurred during the previous two months during the long dry season (Jones & Tye 2006).

Dallimer *et al*. (2009) did not detect these species during a recent systematic bird survey, which included the area of this study, using distance sampling and point counts. Although their study was undertaken at a different season (December–January), when birds may have been less conspicuous, playback proved an effective method of detecting short-tails and (to a lesser extent) fiscals, although the first-named species had probably largely finished breeding and, in principle, was less responsive.

All survey points were at altitudes >1,300 m. The fiscal was found at 1,395 m and short-tails up to 1,540 m, setting new altitudinal limits for both species (Dallimer *et al*. 2003, Jones & Tye 2006). Our short-tail records suggest that at least three and probably four family groups were present along the surveyed trail, or roughly one per 1 km of valley.

We found no significant relationship between the number of short-tails recorded and the type of terrain, sites with canopy cover greater or smaller than 80% or litter cover greater or smaller than 70% (χ^2 tests, all $P>0.05$). All points, except one, were >100 m from permanent water, precluding a more detailed analysis about the suggested relationship between short-tails and streams (Jones & Tye 2006). These results should be viewed with caution because of the small sample size and limited period of the study.

Our survey confirmed that short-tails do occur in the montane forests of the central São Tomé massif at altitudes above those recorded in the literature, and suggest fiscals do likewise. The number of short-tail records, territorial behaviour and the presence of family groups strongly suggest the species is resident rather than transient at these elevations. That both fiscals and short-tails can occur in montane forests was to be expected, given that both survived the loss of most low-elevation forests to shade cacao and coffee plantations in the

TABLE 1

Results of the playback survey for São Tomé Short-tail *Amaurocichla bocagii* along a 4-km stretch of trail in the central massif of São Tomé, 16–17 August 2008.

Point	Time (morning)	No. birds	Time (afternoon)	No. birds	Terrain	Distance to water	Litter Cover	Canopy Cover	Altitude	Latitude	Longitude
0	06.06 h	0	14.10 h	0	Plateau	>100 m	100%	81%	1,545 m	00°15′40.7″N	006°33′29.7″E
1	06.37 h	0	14.30 h	0	Plateau	>100 m	100%	75%	1,530 m	00°15′41.3″N	006°33′31.7″E
2	07.03 h	0	15.00 h	0	Slope	>100 m	52%	63%	1,500 m	00°15′41.4″N	006°33′29.4″E
3	07.33 h	1	16.20 h	7	Slope	>100 m	44%	63%	1,480 m	00°15′50.0″N	006°33′43.1″E
4	08.00 h	1	16.50 h	1	Slope	>100 m	44%	69%	1,460 m	00°15′50.4″N	006°33′47.7″E
5	08.40 h	0	14.40 h	1	Slope	>100 m	88%	63%	1,420 m	00°15′49.4″N	006°34′06.7″E
6	09.10 h	0	15.03 h	1	Slope	>100 m	80%	25%	1,395 m	00°15′50.4″N	006°33′47.7″E
7	09.40 h	0	15.28 h	1	Slope	>100 m	100%	88%	1,390 m	00°15′50.4″N	006°36′47.7″E
8	10.00 h	0	15.50 h	0	Slope	>100 m	63%	75%	1,380 m	00°15′50.1″N	006°34′02.4″E
9	10.30 h	0	16.30 h	0	Slope	>100 m	100%	88%	1,395 m	00°15′49.7″N	006°34′07.9″E
10	08.45 h	2	15.55 h	0	Ridge	70 m	100%	88%	1,540 m	00°15′43.2″N	006°33′35.2″E
11	08.15 h	9	15.26 h	0	Plateau	>100 m	100%	75%	1,520 m	00°15′54.2″N	006°33′37.3″E
12	07.50 h	1	14.48 h	0	Plateau	>100 m	100%	88%	1,455 m	00°16′00.2″N	006°33′40.6″E
13	07.20 h	3	14.10 h	0	Ridge	>100 m	100%	81%	1,395 m	00°16′00.3″N	006°33′46.5″E
14	06.50 h	1	13.40 h	0	Plateau	>100 m	100%	88%	1,365 m	00°16′05.9″N	006°33′49.9″E
15	07.05 h	0	13.55 h	0	Plateau	>100 m	63%	75%	1,645 m	00°15′41.0″N	006°33′24.4″E
16	07.30 h	0	13.30	0	Plateau	>100 m	100%	63%	1,659 m	00°15′39.6″N	006°33′18.3″E
17	07.55 h	0	12.55 h	0	Ridge	>100 m	52%	100%	1,660 m	00°15′46.1″N	006°33′11.4″E
18	08.30 h	0	12.30 h	0	Ridge	>100 m	69%	63%	1,666 m	00°15′49.1″N	006°33′11.5″E
19	08.55 h	0	12.03 h	0	Ridge	>100 m	50%	75%	1,599 m	00°15′54.3″N	006°33′08.5″E

18–19th centuries (Seibert 2002, Jones & Tye 2006). On the other hand, the specific habitat characters that determine the presence of both species demand proper assessment, as they remain unrecorded from apparently suitable sites that are well covered by ornithologists and birdwatchers, such as Lagoa Amélia (Christy & Clarke 1998).

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The taxonomic and conservation status of *Milvus* kites in the Cape Verde archipelago: further (and final?) reflections

by Sabine M. Hille & Nigel J. Collar

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Summary.—Records of Red Kite *Milvus* (*milvus*) *fasciicauda* and Black Kite *M. migrans* on the Cape Verdes have been clouded by the difficulty of telling them apart (some earlier visitors not realising both species occurred). This convergence of identities may in part be due to hybridisation, although the two taxa appear to have been segregated to some extent by geography (*fasciicauda* on islands in the north-west and south-west, *migrans* on islands in the east). Recently, the form *fasciicauda*, regarded by some as a species, was judged not even to exist as a valid taxon; however, this conclusion was based in part on genetic analysis of birds attributable to *M. migrans*. Unfortunately, Red Kites have now almost or actually died out on the Cape Verdes, and Black Kites, showing somewhat different morphometrics from mainland birds and of intrinsic interest, are down to critically low numbers but still merit study.

The Cape Verde archipelago is the westernmost point in the global ranges of both the Red Kite *Milvus milvus* and Black Kite *M. migrans* (Hille & Thiollay 2000). Red Kite is known there by an endemic form, *M. milvus fasciicauda*, whereas the Black Kite of the islands is considered part of nominate *M. migrans migrans*. However, *fasciicauda* is morphologically less distinctive than nominate *milvus*, so that it is not so readily separated in the field from *migrans* (Hazevoet 1995, Hille & Thiollay 2000). Indeed, Bourne (1955) bluntly wrote of the Cape Verde Red Kite that it 'looks like the Black Kite', unaware of the latter's presence in the archipelago, so that some of his records of the former quite possibly referred to the latter. This problem of confused identities afflicts statements in the literature back to at least the 1860s and, despite the clarifications of Hazevoet (1995), still confounds our understanding of the former status and distribution of the two taxa in the archipelago. Moreover, the Abbé de Naurois (1984 and pers. comm.) plausibly suggested that hybridisation between Red and Black Kites had been occurring for some time, causing the former's decline towards extinction, and further exacerbating the problem of identification. A specimen from the southern island of Santiago has been considered a hybrid *fasciicauda* × *migrans*, and certain unattributable individuals observed on Santiago and Santo Antão in 1986–93 were also presumed to be hybrids (Hazevoet 1995), although actual proof by observation or molecular analysis is lacking (Hille & Thiollay 2000). An alternative explanation for the intermediacy of *fasciicauda*, favoured by Hazevoet (1995), is that it is or was a relic of the ancestor of Red and Black Kite before it divided into these two species (de Naurois 1987).

Conservation interest in *fasciicauda* was first promoted by Hazevoet (1995), who elevated it to species level under a phylogenetic species concept. Sangster (2000) then used the case of *fasciicauda* to develop Hazevoet's (1996) argument that the reliance of conservationists on the Biological Species Concept was resulting in the unopposed and indeed unrecognised extinction of taxa relegated to the status of subspecies. Independently, however, work by SMH on the kites of the Cape Verdes began in 1996 as an extension of her European *Milvus* studies (e.g. Hille 1995), and this led to further publicity for the plight of both taxa, whatever their taxonomic status (Hille & Thiollay 2000). This, in turn, generated a Peregrine Fund (PF) project, implemented by SMH in October 2000–June 2002, to survey the entire archipelago for *fasciicauda* (which at the time PF, following Hazevoet 1995, considered a species), with a view to taking any individuals found into captivity for breeding (Watson 2001, 2002). The very brief accounts of this research in Watson (2001) and Anon. (2002) were, however, crucially mistaken in indicating that the six birds recorded in May–August 2001 on the eastern islands of Boavista (four) and Maio (two) belonged to *fasciicauda*, rather than just being six *Milvus* whose specific identity was uncertain (resembling Palearctic and African *migrans*, but with a somewhat different jizz: SMH & S. Thomsett pers. obs.).

Five birds were eventually captured in June 2002, all on Maio—not on Maio and Boavista as stated in Johnson *et al.* (2005), which is presumably the source of the statement in Clarke (2006) that *fasciicauda* was 'also recorded recently on Boavista and Maio'. They were transferred to a breeding facility in the UK where they 'were found to share characteristics of both Red Kites and Black Kites with substantial variation between individuals', such that 'molecular genetics will be needed to determine if and how these birds may be paired to breed and preserve the genes of Cape Verde Red Kites' (Anon. 2001). In fact, this genetic analysis (Johnson *et al.* 2005) demonstrated that the five captive birds were all Black Kites. Prior to (and ignorant of plans to conduct) this genetic work, a parallel analysis of the same blood samples was undertaken in Germany involving not only mitochondrial cytochrome *b* but also nuclear DNA using Simple-Sequence Repeat profiles, and with this greater body of evidence it was also found that birds from Maio grouped together with Black Kites (SMH & M. Wink unpubl.). As a result, further plans by PF to conserve the kites of the Cape Verdes, including the breeding of the five captive individuals, were dropped (Johnson *et al.* 2005).

But were the birds captured on Maio in any way representative of the Cape Verde Red Kite, as Johnson *et al.* (2005) assumed? All the evidence, circumstantial and direct, points against this. The form *fasciicauda* was never known from Boavista or Maio: Hazevoet (1995) marshalled all the records, ancient and modern, and listed the taxon only for Santo Antão, São Vicente, São Nicolau, Santiago and Brava (with its satellite Rombo), adding that its general (though not absolute) preference for montane areas, as against the use of coastal and low-lying areas by *migrans*, suggests that in historical times it may never have occurred on the relatively flat Sal, Boavista and Maio. Moreover, six months' research across the archipelago in 1996–97 produced sightings of *fasciicauda* on Santo Antão only and of *migrans* on Boavista only (Hille 1998, Hille & Thiollay 2000); and photographs taken in 2001 of birds on Boavista and in 2002 of captured birds on Maio confirm that, as judged at the time (see above), the birds were phenotypically akin to *migrans*.

Although DNA evidence from *fasciicauda* museum specimens suggests that this form sits polyphyletically within the Red Kite clade (Johnson *et al.* 2005), the bootstrap values involved were generally all low and it may be that, with more iterations and use of a second marker, *fasciicauda* would group monophyletically. This would have the likely effects of (a) reinstating the form as a valid taxon, and therefore (b) reopening debate about its specific or subspecific status and about the conservation of evolutionary significant units (ESUs), defined by a combination of reproductive and historical isolation (Moritz 1994) and adaptive distinctiveness (Lande & Shannon 1996, Lynch *et al.* 1999).

The same considerations apply to the seemingly undifferentiated Black Kites of the eastern islands. That these birds, according to Johnson *et al.* (2005), cluster with Palearctic Black Kites and not with the geographically far closer (Yellow-billed) Black Kites *Milvus migrans parasitus* (sometimes treated as a separate species; present in adjacent West Africa) suggests that they, like *fasciicauda*, possess intrinsic interest and value. Despite the absence of genetic differentiation, the five birds from Maio provide at least a hint of evidence of adaptation to local insular conditions. SMH measured ten ecologically relevant variables—wing length, length of each toe (i.e. four values), tarso-metatarsal length, inter-tarsal joint width, Kipp's distance (wingtip to tip of secondary 1), bill length and body mass (see Leisler & Winkler 1985, 1991)—among 40 individual kites, namely ten *Milvus migrans migrans*, three *M. migrans parasitus*, 22 *M. milvus milvus* and the five birds from Maio, all living at the Wildtier- und Artenschutzstation, Sachsenhagen, Germany, and the National Birds of Prey Centre, Newent, UK. All birds measured were adult and the sexes were distributed evenly within groups except that the five birds from Maio consisted of four females and one male. Data were adjusted by dividing all characters by the cube root of the body mass, transformed to natural logarithms and analysed with canonical variates analysis (CVA: ter Braak 1995). The results (Fig. 1) reveal that, despite their genetic make-up, morphometrically Maio kites are more different from Black Kite than they are from Red, perhaps as an adaptation to their aerial snatching of large orthopterans from trees in the Cape Verdes (SMH pers. obs.).

Clearly, however, neither kite in the archipelago represents a powerful case for conservation attention from major broad-remit international bodies. Hazevoet's (1995) morphological diagnosis of *fasciicauda*, by which he elevated it to species level, involves a fairly tenuous set of characters that not only may be shown, to some degree, by certain individuals within nominate *milvus* (barred tails can, for example, be found relatively easily when examining images of continental Red Kites on the internet), but also may quite possi-

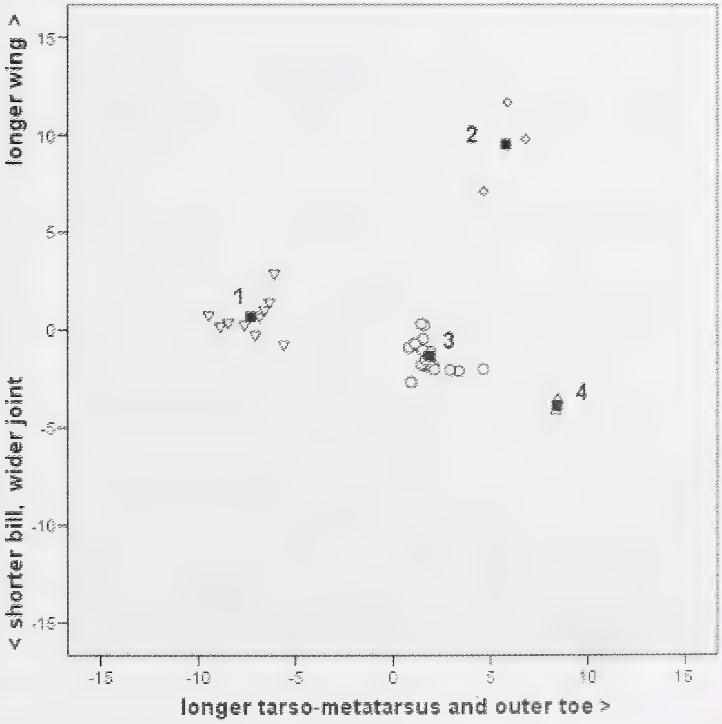

Figure 1. Plot of the scores resulting of a canonical variate analysis (CVA) with respect to (1) *Milvus migrans migrans*, (2) *M. migrans parasitus*, (3) *M. milvus milvus* and (4) Maio birds. Unit of scale is the standard deviation of the scores relative to the mean. We grouped individuals according to taxonomic origin. With CVA we obtained one highly significant factor (chi-square = 192.63, F.G. = 18, p<0.001). It correlates mainly with five variables. Variables on the x-axis describe 70% and on the y-axis 28% of the variation.

bly have derived from a degree of introgression with *migrans*. Likewise, it is arguable that the variation in the Maio birds derives from a small degree of introgression, by recent ancestors moving between islands, with *M. milvus fasciicauda* (and thus these birds may possess genes from an otherwise probably extinct form) and / or a small degree of local adaptation to a prey-poor environment.

Even so, both taxa could still be considered strong regional or specialist priorities as nationally threatened species, ESUs and / or targets of groups interested in the conservation of raptor populations (things that BirdLife International, despite its cardinal focus on full species, has always readily promoted: see, e.g., Collar 1996). Unfortunately, however, the latest evidence from the Cape Verdes suggests that it is now too late, as birds answering the description of *fasciicauda* on the north-western and south-western islands can no longer be found. With the Black Kite population also dwindling—a roosting flock of 22 found on Maio on 18 July 2002 probably represented the great majority of birds remaining there and on adjacent Boavista (SMH pers. obs.)—we now face the loss of two enigmatic and interesting populations, and their associated functions and values, from the Cape Verde fauna. Of the five Maio birds captured in 2002, only two (a potential pair) remain alive, now at the Zoological Society of London (and still the property of the Cape Verde government); it is a matter of current discussion whether they should be encouraged to breed or returned to and freed on their island of origin (J. A. Ellis *in litt.* 2009). Certainly the Black Kites of the archipelago, though few in number, still offer important research opportunities (e.g. foraging adaptations and physiological and reproductive responses in a windswept food-poor environment), and academic engagement with their plight might yet help determine and promote appropriate remedial actions.

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First sight records of White-chested Swift *Cypseloides lemosi* in Bolivia, with documented records of *C. lemosi* and White-chinned Swift *C. cryptus* in Peru

by Ignacio Roesler, Guy M. Kirwan, M. Gabriela Agostini, David Beadle, Hadoram Shirihai & Laurence C. Binford†

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Summary.—We present new records of the little-known White-chested Swift *Cypseloides lemosi* from northern Peru and north-west Bolivia; photographic documentation is available for one of the Peruvian records, whilst the sight-only Bolivian records represent the species' first mention for the country. We also present a photographically documented record of the almost equally poorly known White-chinned Swift *C. cryptus* from north Peru, along with two previously unpublished specimen records from the same country, and discuss some aspects of the identification of both these swifts.

The poorly known White-chested Swift *Cypseloides lemosi*, Eisenmann & Lehmann, 1962, was described from south-west Colombia, in which country there have now been records in dptos. Valle, Cauca and Amazonas, with an overall altitudinal range of 350–2,000 m (Chantler & Driessens 2000, Downing & Hickman 2002). It was subsequently discovered in north-eastern Ecuador, in prov. Napo, where the species was first noted as recently as March 1990 (Ridgely & Greenfield 2001, Howell 2002). Records in this country are from the east-slope subtropics, foothills and lowlands of Amazonia, with those in the latter region being mainly in July–August, as well as a single claim from coastal west Ecuador (Lopez-Lanús 2001). In August 1994, *C. lemosi* was observed for the first time in northern Peru, during a multidisciplinary survey of the Cordillera del Cóndor, with tape-recorded documentation (Schulenberg & Awbrey 1997). There have been several subsequent sight records in Peru, as far south as dpto. Cusco, in Manu Biosphere Reserve (Walker *et al.* 2006), and well into western Amazonia at the río Yavarí (Lane *et al.* 2003, Schulenberg *et al.* 2007), making it almost unsurprising that there should have been a claim from adjacent Brazil, at Palmarí Lodge, on the east bank of the Yavarí (Javari), in Amazonas state, on 10 September 2004 (S. Hansson *in Cotinga* 26: 92). Lane *et al.* (2003) witnessed an apparently large number of *C. lemosi*, consorting with other swifts, on migration over the Yavarí from Brazil into Peru on 28 March 2003. However, there have been no published specimen / photographic records away from Colombia. Here we report the first observation of White-chested Swift in Bolivia, marking a new southernmost limit for *C. lemosi*, along with photographic records of this species and White-chinned Swift *C. cryptus* in Peru, as well as two previously unpublished specimen records of the latter from Peru.

White-chested Swift

Bolivian observations.—Between 27 and 29 December 2005, IR and MGA were conducting ornithological field work on the east slope of the Andes between Caranavi (15°50′S, 67°33′W), in dpto. La Paz, and Rurrenabaque (14°26′S, 67°31′W), in dpto. Beni (Fig. 1). Via Ruta Nacional 3 and 8, they traversed an elevational gradient commencing at just over 600 m down to 250 m. On 28 December they observed a group of ten White-chested Swifts in

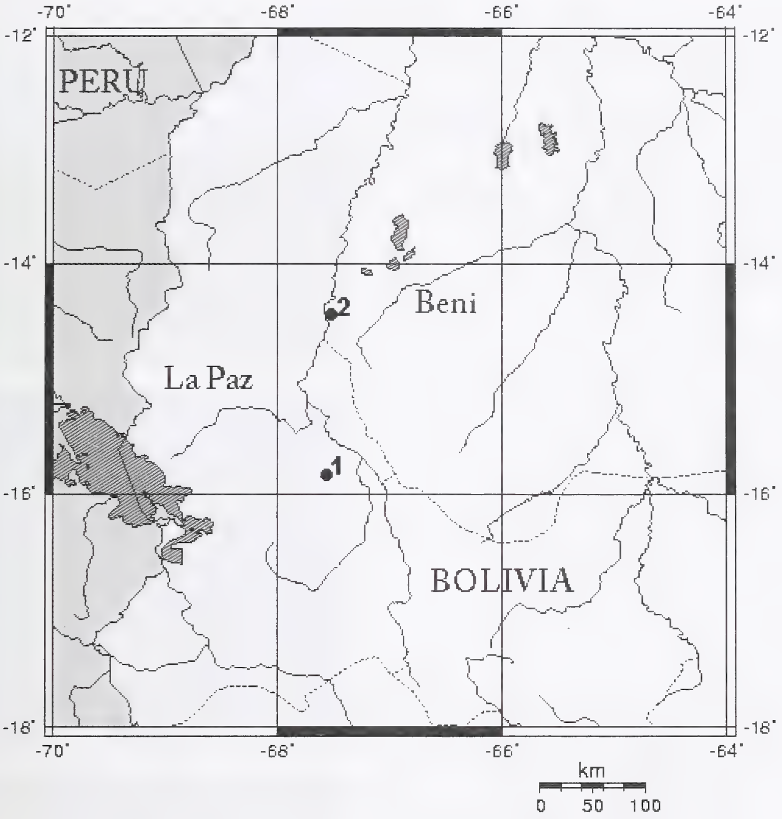

Figure 1. Map showing the region of Bolivia in which IR and MGA observed White-chested Swift *Cypseloides lemosi*. Localities are denoted as follows: 1 = Caranavi, dpto. La Paz; 2 = Rurrenabaque, dpto. Beni.

flight over an extensive area of secondary woodland in the montane zone north-east of Caranavi, on the outskirts of the village of Carrasco. The next day, at 07.30 h, IR observed another group of *C. lemosi*, this time numbering 30 individuals, together with a group of other swifts comprising White-collared Swift *Streptoprocne zonaris* and Short-tailed Swift *Chaetura brachyura* in the environs of Rurrenabaque. An hour later, at 08.30 h, 2 km away, IR observed again what he considered to be the same group of birds. Around Rurrenabaque natural habitats have been extensively modified by man's activities, and the best-preserved fragments were atop low hills. Identification of the swifts concerned as belonging to the genus *Cypseloides* was made on the basis of their flight silhouette, which was similar to that of congeners with which IR and MGA are familiar. IR, especially, was cognisant of the difficulties of specifically identifying *Cypseloides* spp., including their separation from members of other genera of Apodidae, but the white chest patch (lacking in congenerics that might be expected in this area, namely Rothschild's Swift *C. rothschildi* and *C. cryptus*) was clearly noticed. In fact, in this case, greater care was needed to distinguish the *C. lemosi* from *S. zonaris*, as was noted by Hilty & Brown (1986), but fortunately during the observations on 29 December the two species could be compared directly, when the larger overall size, the longer and proportionately slimmer wings, and complete white collar of the White-collared Swifts could be fully appreciated. Ours are the first sightings of White-chested Swift in Bolivia (Hennessey *et al.* 2003, Herzog & Maillard 2008) and represent a range extension of *c.*600 km from the previous southernmost known site.

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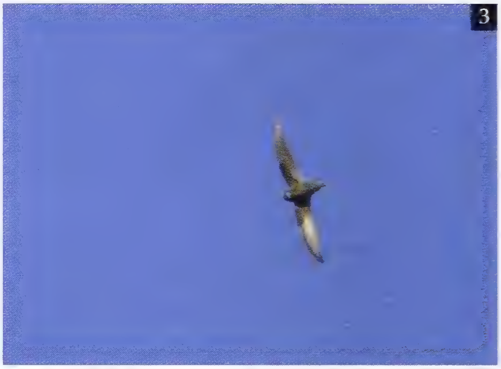

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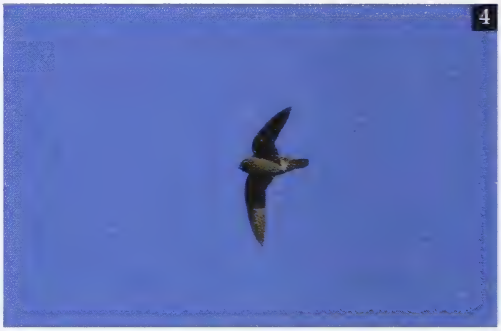

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Figure 2. The environs of Caranavi, dpto. La Paz, Bolivia, over which area a group of White-chested Swift *Cypseloides lemosi* was observed on 28 December 2005 (Ignacio Roesler)

Figure 3. White-chested Swift *Cypseloides lemosi*, presumed female, Abra Patricia, San Martín, Perú, 25 October 2008 (Hadoram Shirihai / *Photographic handbook of birds of the world*, by Jornvall & Shirihai, A. & C. Black, London); note the slight tail-fork, striking contrast between the paler flight-feathers and darker underwing-coverts, the pale breast-band, which obviously does not extend onto the neck (although it is narrower than the heart-shaped patch shown by many individuals, and appears to be slightly higher on the breast than usual), and the rather longer wings than in Chestnut-collared Swift *Streptoprocne rutila*.

Figure 4. Juvenile White-chinned Swift *Cypseloides cryptus*, Abra Patricia, San Martín, Perú, 25 October 2008 (Hadoram Shirihai / *Photographic handbook of birds of the world*, by Jornvall & Shirihai, A. & C. Black, London); note the obvious white tips to the underparts, from the mid breast down, which become much more marked, forming a blotchy effect, over the crissum.

Peruvian observations.—During a photographic trip to the north of the country, in mid-September–mid-November 2008, White-chested Swifts were observed twice. On 30 September, DB and GMK watched a flock of *c*.20 *C. lemosi* flying south in a single group over the río Yanayacu, close to Muyuna Lodge, 140 km south of Iquitos, in dpto. Loreto. They were identified based on their general structure, which permitted their assignment to *Cypseloides*, and the diffuse and irregular white breast patch visible on several individuals in the flock confirmed the species identification. Between us, we have extensive experience of almost all potential confusion species recorded in South America. Subsequently, on 25 October, DB, GMK and HS were observing large numbers of White-collared Swifts *Streptoprocne zonaris* and Chestnut-collared Swifts *S. rutila* departing their montane roost sites, east of the pass at Abra Patricia, dpto. San Martín, at *c*.1,900 m (*c*.05°40′S, 77°46′W). Some were passing <50 m from us, but others were up to 250 m distant. HS was photographing the swifts, whilst DB and GMK scanned the flock with binoculars. GMK eventually drew the others' attention to two birds, which he identified as *C. lemosi*, based on their overall size (fractionally larger and longer-winged than *S. rutila*), only very slightly forked tails (compared to *S. zonaris*, whereas most *S. rutila* appeared to have square-ended tails), blunter and shorter wings than *S. zonaris*, and the white patch confined to the breast, rather than extending as a complete collar. Unfortunately, it was not possible to distinguish any vocalisations definitely emitting from the two birds we were watching. We concur with Howell (2002) that in shape and structure, e.g. wing length etc., *C. lemosi* seems closest to American Black Swift *Cypseloides niger*.

HS photographed one individual at a distance of 200–300 m (Fig. 3), apparently a female, based on the rather smaller white breast patch. The underwing pattern is typical of the genus in the notably pale flight feathers contrasting very well with the much darker underwing-coverts. Both *Streptoprocne* and *Chaetura* also show broadly similar patterns, but the level of contrast is often much less striking in even light conditions in the former genus (see photographs of *S. zonaris* and Biscutate Swift *S. biscutata* in Kirwan 2007) and in *Chaetura* the pale area is also less strikingly contrasting in most lights whilst the coverts (i.e. the dark area) occupy a perceivably more restricted part of the wings. To our knowledge, this constitutes the second documented record of *C. lemosi* for Peru, and an in-country altitudinal range extension of *c*.300 m (Schulenberg *et al*. 2007).

White-chinned Swift

Peruvian field records.—Remarkably, when we subsequently studied all of the photographs of swifts taken by HS at Abra Patricia, we found that he had also photographed, at equally long range, a juvenile of the almost equally poorly known *Cypseloides cryptus* (Fig. 4), thereby underlining the possibilities and opportunities presented by digital SLR high-speed photography. The white-tipped feathers of the underparts, which become broader and more obvious over the vent, are obvious in the photograph, making the identification reasonably straightforward, as juvenile *S. rutila* does not display such a pattern (Chantler & Driessens 2000, Schulenberg *et al*. 2007). Presumed juveniles of *S. rutila* photographed on the same day at this site show some pale tips to the larger wing-coverts but none on the underparts. *C. niger*, which has never been recorded in Peru (Schulenberg *et al*. 2007), or Ecuador (Ridgely & Greenfield 2001), can show variable white tips to the feathers of the rear underparts (Zimmer 1945), but the bird photographed by HS lacks the strong contrast between the darker underparts and paler head to upper breast typical of *C. niger borealis* (the only race definitely known to occur in South America), and has an obviously square-ended tail, whereas *C. niger* usually shows a more or less obvious tail-fork in males, often reduced to a notch in females (Stiles & Negret 1994). Juvenile *C. lemosi* is reportedly much like the female of that species, i.e. in showing a much-reduced but evident white breast patch (Chantler & Driessens 2000), and would presumably also possess that species' 'larger swift' proportions.

Specimen records from Peru.—Other than the type specimen, from the 'Inca Mine' on the río Tavara (Zimmer 1945), there has been no previously published documentation for *C. cryptus* in Peru. However, Zimmer (1945, 1953) already drew attention to two problematic specimens of *Cypseloides* swifts held in what is now The Natural History Museum, in Tring, UK (BMNH). Both specimens, one, a male, from Cosñipata, western Peru (close to the type locality of *cryptus*) collected by H. Whitely in (November?: label partially illegible) 1868 (BMNH 90.2.18.58), and the other labelled as being from 'Ecuador' from the Gould collection (BMNH 88.7.30.66), were originally identified as Sooty Swift *C. fumigatus*, a species now considered to be confined to south-east South America (Chantler 1999). The two were re-identified as *C. cryptus* as long ago as 1966, by C. T. Collins, and have been catalogued by the museum as that species ever since. Despite this, P. Chantler, who worked in the same collection in preparing the text of Chantler & Driessens (2000) considered there to be 'only [one] certain specimen from that country [Peru]', and apparently continued to treat the Whitely specimen as pertaining to *C*. (*fumigatus*) *rothschildi*. Collins (1968) published on the identity of the Ecuadorian specimen, which remains the only documentation of the species for that country (Ridgely & Greenfield 2001). Both specimens were re-examined by P. C. Rasmussen and D. Davison in 2001, and by GMK in 2009. Zimmer (1945, 1953) did not examine either bird, but published measurements of the Peruvian specimen (Taczanowski

TABLE 1

Mensural data for two specimens of White-chinned Swift *Cypseloides cryptus* from Ecuador and Peru, held at The Natural History Museum, Tring, UK (BMNH), compared with published data for the same species and published and unpublished measurements for Sooty Swift *C. fumigatus* and Rothschild's Swift *C. rothschildi* (Zimmer 1945, Eisenmann & Lehmann 1962, Belton 1984, Marín & Stiles 1992, Chantler & Driessens 2000). All data are from specimens, except those published by Marín & Stiles (1992), which are from live birds. Our data = specimens measured by GMK at BMNH using a metal wing-rule and digital callipers, and following standard parameters. All measurements in mm.

Source → Taxon ↓	Zimmer (1945)	Eisenmann & Lehmann (1962)	Belton (1984)	Marín & Stiles (1992)	Chantler & Driessens (2000)	Own data (from BMNH specimens)
C. cryptus						
Wing	136.5 (*n*=1)	136–143 (*n*=4)		136.44 ± 1.71 (*n*=14)		142 (*n*=2)
Tail	43 (*n*=1)	40–49 (*n*=4)		44.02 ± 1.40 (*n*=10)		46–47 (*n*=2)
Tarsus	16 (*n*=1)	15–16 (*n*=4)		15.69 ± 0.32 (*n*=13)		16.34–17.3 (*n*=2)
C. fumigatus						
Wing		153 (*n*=1)	135–147 (*n*=4)		142.5–146.5 (*n*=4)	142–145 (*n*=4)
Tail		49 (*n*=1)				49–55 (*n*=4)
Tarsus		12 (*n*=1)				13.2–14.61 (*n*=4)
C. rothschildi						
Wing		147–157 (*n*=7)				
Tail		47–56 (*n*=7)				
Tarsus		12 (*n*=1)				

1884: 232) suggested to him that the identification as *fumigatus* should stand. The Ecuadorian specimen (wing-chord 142 mm, tail 46 mm, tarsus 16.34 mm: GMK pers. obs.) is a classic example of *cryptus*, having the chin and throat notably pale, whilst the Whitely bird from Peru only has a very restricted pale area on the chin, which would be almost certainly invisible in the field (as is often the case with this species: Chantler & Driessens 2000). Nonetheless, it can still be confidently identified as *cryptus*, based on the general plumage coloration, and the shape and size of the nostrils, which differ from *C. niger* (Chantler & Driessens 2000: 110; GMK pers. obs.) and *C. fumigatus* (GMK pers. obs.). Its measurements (wing-chord 142 mm, tail 47 mm, tarsus 17.3 mm: GMK pers. obs.) are, *contra* Zimmer (1945, 1953), far more concordant with *cryptus* than *fumigatus* (see Table 1), especially in the shorter tail and longer tarsi, and given that the classic Ecuadorian specimen of *cryptus* also has a long wing-chord (like two Colombian male specimens: Eisenmann & Lehmann 1962). Given this, we can confidently state that there is no record of Rothschild's Swift *C. rothschildi* (a species formerly considered conspecific with *C. fumigatus*) for Peru, *contra* Chantler & Driessens' (2000) repetition of Zimmer (1945), either as a winter visitor (Short 1975) or vagrant. Finally, there is another unpublished specimen from Peru, held at the Louisiana State University Museum of Zoology, in Baton Rouge (LSUMZ 98105) of a *C. cryptus* from Abra de Maruncunca, 10 km south-west of San José del Oro, dpto. Puno (2,000 m), which was collected by LCB (collector's number 1527), on 12 November 1980, being caught by hand (!) fluttering against the wall of a well-lit tent at 22.45 h. It was a female, with ovary 7 × 4 mm, largest ova 1 mm and 0.5 mm. The skull was 50% ossified (indicating immaturity); no moult; total length 125 mm; very fat; weight 31.3 g; insect parts in stomach.

Discussion

Neither *C. lemosi* nor *C. cryptus* was mentioned for the Abra Patricia region by Hornbuckle (1999), but T. S. Schulenberg (*in litt*. 2009) informs us that the late P. Coopmans (*in litt*. to Schulenberg, November 2003) observed several *C. lemosi* in the area on 18 October 2003, and T. S. Schulenberg (*in litt*. 2009) & F. P. Angulo observed a small flock at the same place as we made our observations in late September 2007. Stiles & Negret (1994) already noted that *C. cryptus* can join mixed flocks with *S. zonaris*, *C. lemosi* and *S. rutila*, based on observations in southern Colombia, and *C. cryptus* and *S. rutila* have also been observed together in Costa Rica (Marín & Stiles 1992). The presence of a fresh juvenile could suggest that the species breeds somewhere in the environs of Abra Patricia (M. Marín *in litt*. 2009).

The altitude of our second Bolivian observation, 250 m, is the lowest specifically mentioned in the literature to date, although given the Amazonian observations reported above and in other literature *C. lemosi* can clearly be expected to occur down to sea level. Observations from throughout the range of White-chested Swift, from montane regions to the lowlands of Amazonia indicate that the species is a habitat generalist and that it is not restricted to inter-Andean valleys, as was formerly thought to be the case (Hilty & Brown 1986, Chantler 1999), or at least not year-round. More observations are needed to determine whether *C. lemosi* performs regular intra-tropical migrations. The forests surrounding Rurrenabaque, in those areas visited by IR and MGA, are extremely threatened, principally due to expanding agricultural concerns, especially large farms. BirdLife International (2008) currently treats *C. lemosi* as Low Risk, given that advancing deforestation in many parts of the species' known range probably favours it. Future workers should seek to identify the species' breeding areas in both Bolivia and Peru, and identify any threats to such places. There are numerous waterfalls in the environs of Caranavi, which might serve as breeding sites for *C. lemosi* (IR & MGA pers. obs.), and given this and the time of year (December) in which our observations were made it seems quite probable that the species breeds in Bolivia (as well as in Peru).

It seems certain to be the case that the overall status and distribution of *C. lemosi* (and *C. cryptus*) have been under-estimated due to the difficulties in identifying the species, as evidenced in part by the recent discovery of *C. cryptus* in northern Brazil (Whittaker & Araújo Whittaker 2008; GMK pers. obs.). There have been observations of suspected *C. cryptus* at Palmari Lodge on the east bank of the Yavarí, and Lane *et al*. (2003) suspected that some of this species were also involved in the large swift migration they witnessed on the Peruvian side in late March 2003 (see above). Whilst the white chest offers a 'sure-fire' means of separating *C. lemosi* from other swifts, lighting conditions under which the extent of this can be accurately determined need to be exceptionally favourable, and the distance of observation is often a telling factor preventing certain identifications.

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Birds associated with bamboo forests in eastern Acre, Brazil

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Summary.—Rainforest habitats dominated by arborescent bamboo of the genus *Guadua* are common in south-west Amazonia. We gathered data on the avifauna associated with this type of forest in south-west Brazil, in eastern Acre, during November 2006. Birds were surveyed using mist-netting, observations and recordings of vocalisations, and a total of 266 bird species was recorded, 20 (7.5%) of which are considered to be strictly associated with bamboo forest. Our survey also extended the known ranges of several bamboo forest specialist species in south-west Amazonia, and confirmed the importance of this habitat type for regional biodiversity.

Open forests dominated by arborescent bamboo of the genus *Guadua* cover some 180,000 km² of the south-west Amazon basin, including south-east Peru, northern Bolivia and western Brazil (Nelson *et al.* 1997, Silveira 2005). In the Brazilian state of Acre, these bamboo forests are known as *tabocais*, and form a mosaic of habitats together with Ombrophyllous open forest with palms, open floodplain rainforest and dense rainforest (Acre 2000). Amazonian bamboo forests are unique ecosystems with a rich fauna of vertebrates (Conover 1994, Servat 1996, Kratter 1997, 1998, Lebbin *et al.* 2007) and invertebrates (Conover 1994, Louton *et al.* 1996).

Some bird and mammal species are considered to be bamboo forest specialists, and are only found in areas where this type of forest is present (Kratter 1997, Haemig 2006a,b). Stotz *et al.* (1996) identified 29 bird species in the southern Amazon basin that are closely associated with these *tabocais*, although this number may be an under-estimate, which hypothesis is supported by the recent discovery of a new bird species, Rufous Twistwing *Cnipodectes superrufus*, which is restricted to bamboo forests (Lane *et al.* 2007, Tobias *et al.* 2008). This discovery further emphasises the need for more detailed studies of the unique, but poorly known fauna of these bamboo forests.

With the aim of providing more reliable information on the bird fauna of this type of habitat, we conducted an ornithological expedition to the eastern portion of the Brazilian state of Acre. In addition to a general overview of the study area and the data collected, we present an annotated list of the records of the species most relevant to understanding the ecological characteristics of this unique forest type.

Methods

Study area.—The area surveyed is located at km 11 of the Jarinal road, an offshoot of the Transacreana highway, in the east of the Brazilian state of Acre (09°54′16.5″S, 68°28′26.6″W; Fig. 1). Ornithological surveys were conducted on 11–23 November 2006, at the start of the rainy season, in an area of open *terra firme* forest dominated by bamboos associated with palms. The area surrounding the forest is mainly cattle pasture, with scattered plots of subsistence agriculture. The forest has been subject to selective logging of hardwood trees by local residents in recent years, for both subsistence and commercial purposes.

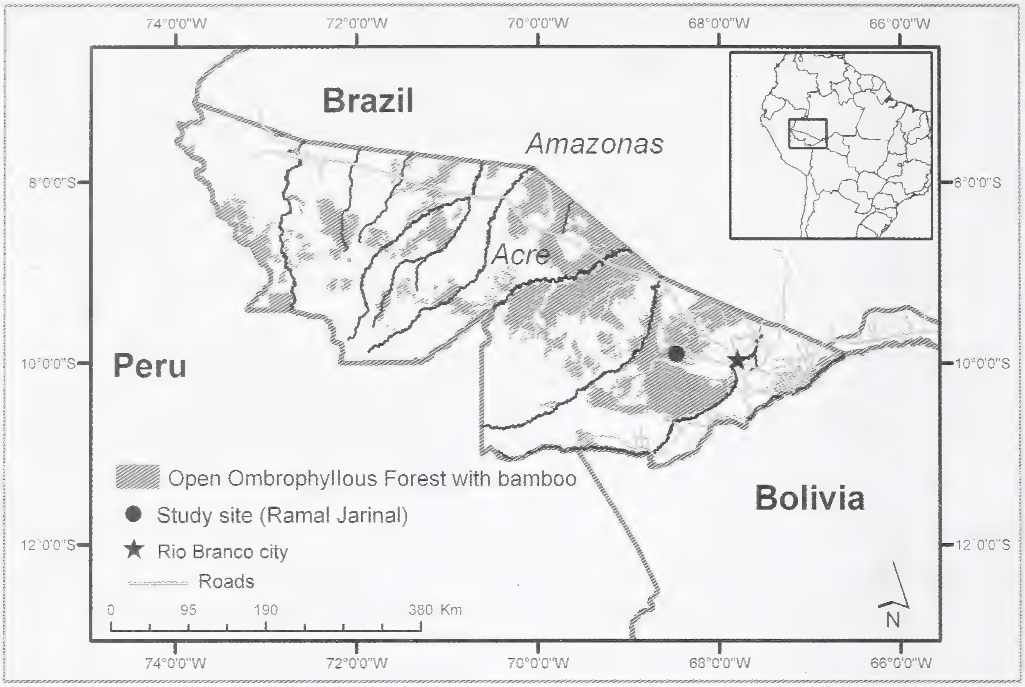

Figure 1. Location of the study site.

Surveys.—The inventory used two complementary approaches. Quantitative sampling was conducted using ten 36 mm-mesh mist-nets, 2 m high by 12 m long, whilst qualitative records were made using binoculars, and recordings of vocalisations were made using a Sony TCM 5000 tape-recorder. Recordings will be deposited at the Museu Paraænse Emílio Goeldi (MPEG) in Belém, Pará. Mist-nets were set along transects within the forest, remaining at each location for three days. The nets were opened at dawn (05.30 h) and were generally kept open until 15.00 h, to maximise the number of captures. In some cases, voucher specimens were collected in order to confirm the presence of the species in the study area. These specimens were prepared using standard taxidermy techniques.

Collection of specimens was authorised by the Brazilian Federal Environment Institute (IBAMA) through licence number 044/2006–COFAN. All specimens are deposited at the MPEG. Nomenclature follows that of the Brazilian Ornithological Records Committee (CBRO 2008).

Results

A total of 266 bird species (Table 1) was recorded during the 12 days of sampling, which encompassed 916 net-hours of mist-netting and eight hours of recording. Twenty of the species are associated with or restricted to lowland bamboo forests in south-west Amazonia, i.e. 7.5% of the total, and almost 70% of the species recognised by Stotz *et al.* (1996) as being predominantly associated with bamboo forests of the southern Amazon basin. An annotated list of species most relevant to understanding the ecological characteristics of this unique forest system is presented below.

TABLE 1

List of families and species of birds recorded on the Jarinal road, eastern Acre, Brazil. Habitat codes: BF = open bamboo forest; R = reservoir; OA = open area; OP = open area with cattle pasture; FE = forest edge. Records: S = specimen deposited at the MPEG, Belém; O = sight record; V = vocalisation sound-recorded. Asterisks denote species considered to be closely associated with bamboo forest in south-west Amazonia as defined by Stotz *et al.* (1996), Kratter (1997) and our observations.

Family (number of species)	Species	English name	Habitat	Record
Tinamidae (6)	*Tinamus tao*	Grey Tinamou	BF	V
	Tinamus guttatus	White-throated Tinamou	BF	V
	Crypturellus cinereus	Cinereous Tinamou	BF	S, V
	Crypturellus soui	Little Tinamou	BF	V
	Crypturellus undulatus	Undulated Tinamou	BF	V
	Crypturellus atrocapillus	Black-capped Tinamou	BF	V
Cracidae (2)	*Ortalis guttata*	Speckled Chachalaca	BF	O, V
	Penelope jacquacu	Spix's Guan	BF	O, V
Odontophoridae (1)	*Odontophorus gujanensis*	Marbled Wood Quail	BF	V
Podicipedidae (1)	*Tachybaptus dominicus*	Least Grebe	R	O
Ardeidae (6)	*Tigrisoma lineatum*	Rufescent Tiger Heron	R	O
	Butorides striata	Striated Heron	R	O
	Bubulcus ibis	Cattle Egret	OP	O
	Ardea cocoi	Cocoi Heron	R	O
	Ardea alba	Great Egret	R	O
	Egretta thula	Snowy Egret	R	O
Threskiornithidae (1)	*Mesembrinibis cayennensis*	Green Ibis	R	O
Cathartidae (4)	*Cathartes aura*	Turkey Vulture	OA	O
	Cathartes melambrotus	Greater Yellow-headed Vulture	OA	O
	Coragyps atratus	Black Vulture	OA	S, O
	Sarcoramphus papa	King Vulture	OA	O
Accipitridae (9)	*Elanoides forficatus*	Swallow-tailed Kite	OA	O
	Gampsonyx swainsonii	Pearl Kite	OP	O
	Ictinia plumbea	Plumbeous Kite	FE	O
	Leucopternis schistaceus	Slate-coloured Hawk	FE	S, O
	Buteogallus urubitinga	Great Black Hawk	FE	O
	Busarellus nigricollis	Black-collared Hawk	FE	O
	Rupornis magnirostris	Roadside Hawk	FE	O
	Buteo albicaudatus	White-tailed Hawk	OP	O
	Buteo nitidus	Grey Hawk	FE	O
Falconidade (7)	*Daptrius ater*	Black Caracara	FE	O, V
	Ibycter americanus	Red-throated Caracara	FE	O, V
	Milvago chimachima	Yellow-headed Caracara	OP	O
	Herpetotheres cachinnans	Laughing Falcon	FE	O
	Micrastur ruficollis	Barred Forest Falcon	BF	S
	Micrastur gilvicollis	Lined Forest Falcon	BF	V
	Falco rufigularis	Bat Falcon	FE	O
Psophiidae (1)	*Psophia leucoptera*	Pale-winged Trumpeter	BF	O
Rallidae (1)	*Porphyrio martinica*	Purple Gallinule	R	O
Charadriidae (1)	*Vanellus cayanus*	Pied Lapwing	OP	O, V
Scolopacidae (1)	*Tringa flavipes*	Lesser Yellowlegs	R	S, O
Jacanidae (1)	*Jacana jacana*	Wattled Jacana	R	O
Columbidae (6)	*Columbina talpacoti*	Ruddy Ground Dove	OP	S, O
	Patagioenas cayennensis	Pale-vented Pigeon	BF	O, V
	Patagioenas plumbea	Plumbeous Pigeon	BF	V
	Patagioenas subvinacea	Ruddy Pigeon	BF	V

	Leptotila rufaxilla	Grey-fronted Dove	BF	S
	Geotrygon montana	Ruddy Quail-Dove	BF	V
Psittacidae (12)	*Ara macao*	Scarlet Macaw	BF	O
	Ara chloropterus	Red-and-green Macaw	BF	O
	Ara severus	Chestnut-fronted Macaw	BF	O
	Orthopsittaca manilata	Red-bellied Macaw	BF, FE	O
	Primolius couloni	Blue-headed Macaw	BF	O
	Aratinga leucophthalma	White-eyed Parakeet	BF, FE	S, O
	Aratinga weddellii	Dusky-headed Parakeet	BF, FE	E, O
	Brotogeris cyanoptera	Cobalt-winged Parakeet	BF	E, O
	Pionites leucogaster	White-bellied Parrot	BF	O
	Pionus menstruus	Blue-headed Parrot	BF	O, V
	Amazona ochrocephala	Yellow-crowned Parrot	BF	O, V
	Amazona farinosa	Mealy Parrot	BF	O, V
Cuculidae (6)	*Coccycua minuta*	Little Cuckoo	BF	O
	Piaya cayana	Squirrel Cuckoo	BF	O
	Piaya melanogaster	Black-bellied Cuckoo	BF	O
	Crotophaga ani	Smooth-billed Ani	OP	O
	Dromococcyx phasianellus	Pheasant Cuckoo	BF	S, V
	*Dromococcyx pavoninus**	Pavonine Cuckoo	BF	S, V
Strigidae (7)	*Megascops choliba*	Tropical Screech Owl	BF, FE	V
	Megascops usta	Southern Tawny-bellied Screech Owl	BF	V
	Lophostrix cristata	Crested Owl	BF	V
	Pulsatrix perspicillata	Spectacled Owl	BF	V
	Glaucidium brasilianum	Ferruginous Pygmy Owl	BF	V
	Athene cunicularia	Burrowing Owl	OP	O, V
	Rhinoptynx clamator	Striped Owl	BF, FE	V
Apodidae (2)	*Chaetura brachyura*	Short-tailed Swift	OA	O
	Thachornis squamata	Fork-tailed Palm Swift	OA	O
Trochilidae (8)	*Glaucis hirsutus*	Rufous-breasted Hermit	BF	S
	Phaethornis ruber	Reddish Hermit	BF	V
	Phaethornis hispidus	White-bearded Hermit	BF	S
	Phaethornis bourcieri	Straight-billed Hermit	BF	S
	Anthracothorax nigricollis	Black-throated Mango	BF, FE	O
	Chlorostilbon mellisugus	Blue-tailed Emerald	BF	O
	Thalurania furcata	Fork-tailed Woodnymph	BF	S
	Amazilia lactea	Sapphire-spangled Emerald	FE	O
Trogonidae (6)	*Trogon melanurus*	Black-tailed Trogon	BF	S, O,V
	Trogon viridis	White-tailed Trogon	BF	O, V
	Trogon violaceus	Violaceous Trogon	BF	O, V
	Trogon curucui	Blue-crowned Trogon	BF	O, V
	Trogon rufus	Black-throated Trogon	BF	O, V
	Trogon collaris	Collared Trogon	BF	O, V
Alcedinidae (5)	*Megaceryle torquata*	Ringed Kingfisher	R	O
	Chloroceryle amazona	Amazon Kingfisher	R	O
	Chloroceryle aenea	American Pygmy Kingfisher	BF	O
	Chloroceryle americana	Green Kingfisher	R	O
	Chloroceryle inda	Green-and-rufous Kingfisher	BF	O
Momotidae (3)	*Electron platyrhynchum*	Broad-billed Motmot	BF	O
	Baryphthengus martii	Rufous Motmot	BF	O
	Momotus momota	Blue-crowned Motmot	BF	S, O, V
Galbulidae (3)	*Brachygalba albogularis*	White-throated Jacamar	BF, FE	S, O
	Galbula cyanescens	Bluish-fronted Jacamar	BF	S, O
	Galbula dea	Paradise Jacamar	BF	O
Bucconidae (10)	*Notharchus hyperrhynchus*	White-necked Puffbird	BF	V
	Bucco macrodactylus	Chestnut-capped Puffbird	BF	O

	Bucco tamatia	Spotted Puffbird	BF	O
	Bucco capensis	Collared Puffbird	BF	O
	Malacoptila semicincta	Semicollared Puffbird	BF	S
	*Nonnula ruficapilla**	Rufous-capped Nunlet	BF	S
	Monasa nigrifrons	Black-fronted Nunbird	BF, FE	O, V
	Monasa morphoeus	White-fronted Nunbird	BF	S, O, V
	*Monasa flavirostris**	Yellow-billed Nunbird	BF, FE	S, O
	Chelidoptera tenebrosa	Swallow-wing	BF, FE	O
Ramphastidae (5)	*Ramphastos tucanus*	Red-billed Toucan	BF, FE	S, O, V
	Ramphastos vitellinus	Channel-billed Toucan	BF, FE	O, V
	Pteroglossus inscriptus	Lettered Aracari	BF	S, O
	Pteroglossus mariae	Brown-mandibled Aracari	BF	O
	Pteroglossus castanotis	Chestnut-eared Aracari	BF, FE	O
Picidae (9)	*Melanerpes cruentatus*	Yellow-tufted Woodpecker	OP; FE	O, V
	Veniliornis passerinus	Little Woodpecker	BF	S
	Colaptes punctigula	Spot-breasted Woodpecker	BF	S
	Celeus elegans	Chestnut Woodpecker	BF	S
	*Celeus spectabilis**	Rufous-headed Woodpecker	BF	S, V, O
	Celeus torquatus	Ringed Woodpecker	BF	O
	Dryocopus lineatus	Lineated Woodpecker	OP; FE	O, V
	Campephilus rubricollis	Red-necked Woodpecker	OP; FE	O
	Campephilus melanoleucos	Crimson-crested Woodpecker	OP; FE	O, V
Thamnophilidae (33)	*Cymbilaimus lineatus*	Fasciated Antshrike	BF	V
	*Cymbilaimus sanctaemariae**	Bamboo Antshrike	BF	S, V, O
	Taraba major	Great Antshrike	BF	S, V, O
	Thamnophilus doliatus	Barred Antshrike	BF	S, V, O
	Thamnophilus schistaceus	Plain-winged Antshrike	BF	S
	Thamnophilus murinus	Mouse-coloured Antshrike	BF	V
	Thamnophilus aethiops	White-shouldered Antshrike	BF	S, V, O
	Thamnomanes schistogynus	Bluish-slate Antshrike	BF	S, V
	Epinecrophylla leucophthalma	White-eyed Antwren	BF	V
	Epinecrophylla haematonota	Stipple-throated Antwren	BF	V
	*Epinecrophylla ornata**	Ornate Antwren	BF	S
	Myrmotherula iheringi	Ihering's Antwren	BF	S
	Myrmotherula hauxwelli	Plain-throated Antwren	BF	V
	Myrmotherula axillaris	White-flanked Antwren	BF	S, V
	Myrmotherula longipennis	Long-winged Antwren	BF	V
	Myrmotherula menetriesii	Grey Antwren	BF	V, O
	*Drymophila devillei**	Striated Antbird	BF	S, O
	Cercomacra cinerascens	Grey Antbird	BF	S
	*Cercomacra manu**	Manu Antbird	BF	S
	Myrmoborus leucophrys	White-browed Antbird	BF	S, O, V
	Myrmoborus myotherinus	Black-faced Antbird	BF	S, O, V
	Hypocnemis peruviana	Peruvian Warbling Antbird	BF	O, V
	*Hypocnemis subflava**	Yellow-breasted Warbling Antbird	BF	S
	*Percnostola lophotes**	White-lined Antbird	BF	S
	Myrmeciza hemimelaena	Southern Chestnut-tailed Antbird	BF	S, O, V
	Myrmeciza atrothorax	Black-throated Antbird	BF	O, V
	*Myrmeciza goeldii**	Goeldi's Antbird	BF	S, V, O
	Myrmeciza hyperythra	Plumbeous Antbird	BF	S, V
	Gymnopithys salvini	White-throated Antbird	BF	S, V
	Rhegmatorhina melanosticta	Hairy-crested Antbird	BF	O, V
	Hylophylax naevius	Spot-backed Antbird	BF	S, V
	Willisornis poecilinotus	Scale-backed Antbird	BF	O, V
	Phlegopsis nigromaculata	Black-spotted Bare-eye	BF	S, O, V
Grallariidae (1)	*Myrmothera campanisona*	Thrush-like Antpitta	BF	V

Formicariidae (2)	*Formicarius colma*	Rufous-capped Antthrush	BF	O, V
	Formicarius analis	Black-faced Antthrush	BF	S, O, V
Scleruridae (2)	*Sclerurus caudacutus*	Black-tailed Leaftosser	BF	S
	Sclerurus albigularis	Grey-throated Leaftosser	BF	S
Dendrocolaptidae (11)	*Dendrocincla fuliginosa*	Plain-brown Woodcreeper	BF	S, V
	Dendrocincla merula	White-chinned Woodcreeper	BF	O, V
	Deconychura longicauda	Long-tailed Woodcreeper	BF	O, V
	Sittasomus griseicapillus	Olivaceous Woodcreeper	BF	S
	Glyphorynchus spirurus	Wedge-billed Woodcreeper	BF	O
	Dendrocolaptes picumnus	Black-banded Woodcreeper	BF	S
	Dendroplex picus	Straight-billed Woodcreeper	OP; FE	O, V
	Xiphorhynchus chunchotambo	Tschudi's Woodcreeper	BF	S
	Xiphorhynchus guttatus	Buff-throated Woodcreeper	BF	S, O, V
	Lepidocolaptes albolineatus	Lineated Woodcreeper	BF	V
	*Campylorhamphus trochilirostris**	Red-billed Scythebill	BF	S
Furnariidae (10)	*Furnarius leucopus*	Pale-legged Hornero	BF	S, O, V
	Synallaxis rutilans	Ruddy Spinetail	BF	O
	*Synallaxis cherriei**	Chestnut-throated Spinetail	BF	S
	*Simoxenops ucayalae**	Peruvian Recurvebill	BF	S, O, V
	Automolus ochrolaemus	Buff-throated Foliage-gleaner	BF	S, V, O
	Automolus infuscatus	Olive-backed Foliage-gleaner	BF	O
	*Automolus melanopezus**	Brown-rumped Foliage-gleaner	BF	S
	Automolus rubiginosus	Ruddy Foliage-gleaner	BF	S
	Automolus rufipileatus	Chestnut-crowned Foliage-gleaner	BF	S
	Xenops minutus	Plain Xenops	BF	S, O
Tyrannidae (30)	*Mionectes oleagineus*	Ochre-bellied Flycatcher	BF	O
	Leptopogon amaurocephalus	Sepia-capped Flycatcher	BF	S
	Corythopis torquatus	Ringed Antpipit	BF	S
	*Lophotriccus eulophotes**	Long-crested Pygmy Tyrant	BF	S
	*Hemitriccus flammulatus**	Flammulated Bamboo Tyrant	BF	O, V
	Hemitriccus minimus	Zimmer's Tody-Tyrant	BF	S
	Myiopagis gaimardii	Forest Elaenia	FE	O, V
	Ornithion inerme	White-lored Tyrannulet	BF	O, V
	Camptostoma obsoletum	Southern Beardless Tyrannulet	FE	O
	Sublegatus modestus	Southern Scrub Flycatcher	FE	O
	*Cnipodectes superrufus**	Rufous Twistwing	BF	S, O, V
	Rhynchocyclus olivaceus	Olivaceous Flatbill	BF	O, V
	Tolmomyias assimilis	Yellow-margined Flycatcher	FE	S
	Lathrotriccus euleri	Euler's Flycatcher	BF	S
	Onychorhynchus coronatus	Royal Flycatcher	BF	S
	Myiobius barbatus	Whiskered Flycatcher	BF	S
	Terenotriccus erythrurus	Ruddy-tailed Flycatcher	BF	O
	Legatus leucophaius	Piratic Flycatcher	FE	O, V
	Myiozetetes cayanensis	Rusty-margined Flycatcher	FE	S, O, V
	Myiozetetes similis	Social Flycatcher	FE	S, O, V
	Pitangus sulphuratus	Great Kiskadee	FE	O, V
	Myiodynastes maculatus	Streaked Flycatcher	FE	O
	Megarhynchus pitangua	Boat-billed Flycatcher	FE	O, V
	Empidonomus varius	Variegated Flycatcher	BF	O
	Tyrannus melancholicus	Tropical Kingbird	FE	O, V
	Myiarchus swainsoni	Swainson's Flycatcher	FE	O
	Myiarchus ferox	Short-crested Flycatcher	FE	S, O, V
	*Ramphotrigon megacephalum**	Large-headed Flatbill	BF	S, V
	*Ramphotrigon fuscicauda**	Dusky-tailed Flatbill	BF	S
	Attila spadiceus	Bright-rumped Attila	BF	S

Cotingidae (2)	*Lipaugus vociferans*	Screaming Piha	BF	O, V
	Querula purpurata	Purple-throated Fruitcrow	BF	O, V
Pipridae (5)	*Neopelma sulphureiventer**	Sulphur-bellied Tyrant-Manakin	BF	S
	Piprites chloris	Wing-barred Piprites	BF	S
	Pipra fasciicauda	Band-tailed Manakin	BF	S, O, V
	Pipra rubrocapilla	Red-headed Manakin	BF	O
	Schiffornis major	Várzea Schiffornis	BF	O
Tityridae (4)	*Laniocera hypopyrrha*	Cinereous Mourner	BF	V
	Tityra cayana	Black-tailed Tityra	BF	O
	Tityra semifasciata	Masked Tityra	BF	O
	Pachyramphus polychopterus	White-winged Becard	BF; FE	S
Vireonidae (2)	*Cyclarhis gujanensis*	Rufous-browed Peppershrike	BF; FE	V
	Vireo olivaceus	Red-eyed Vireo	BF; FE	O
Hirundinidae (2)	*Tachycineta albiventer*	White-winged Swallow	R	O
	Stelgidopteryx ruficollis	Southern Rough-winged Swallow	R	O
Troglodytidae (5)	*Microcerculus marginatus*	Scaly-breasted Wren	BF	O
	Troglodytes musculus	Southern House Wren	OP; FE	O, V
	Campylorhynchus turdinus	Thrush-like Wren	BF	S, O, V
	Pheugopedius genibarbis	Moustached Wren	BF; FE	O, V
	Cyphorhinus arada	Musician Wren	BF	V
Polioptilidade (1)	*Ramphocaenus melanurus*	Long-billed Gnatwren	BF	S
Turdidae (2)	*Turdus ignobilis*	Black-billed Thrush	OP; FE	S, O, V
	Turdus hauxwelli	Hauxwell's Thrush	BF	S, O, V
Coerebidae (1)	*Coereba flaveola*	Bananaquit	FE	O
Thraupidae (14)	*Lamprospiza melanoleuca*	Red-billed Pied Tanager	BF; BF	O
	Habia rubica	Red-crowned Ant Tanager	BF	V
	Tachyphonus luctuosus	White-shouldered Tanager	BF	S, O
	Ramphocelus carbo	Silver-beaked Tanager	FE	S, O, V
	Thraupis episcopus	Blue-grey Tanager	OP; FE	S, O, V
	Thraupis palmarum	Palm Tanager	OP; FE	S, O, V
	Tangara mexicana	Turquoise Tanager	BF	S, O, V
	Tangara chilensis	Paradise Tanager	BF	S, O, V
	Tangara schrankii	Green-and-gold Tanager	BF	O, V
	Tangara nigrocincta	Masked Tanager	BF	O, V
	Tangara velia	Opal-rumped Tanager	BF	O, V
	Dacnis cayana	Blue Dacnis	BF	O, V
	Cyanerpes cyaneus	Red-legged Honeycreeper	BF	O, V
	Hemithraupis guira	Guira Tanager	BF	O, V
Emberizidae (4)	*Ammodramus aurifrons*	Yellow-browed Sparrow	OP	S, O, V
	Volatinia jacarina	Blue-black Grassquit	OP	O, V
	Sporophila castaneiventris	Chestnut-bellied Seedeater	OP	S, O
	Sporophila angolensis	Chestnut-bellied Seed Finch	OP	S, O, V
Cardinalidae (4)	*Saltator grossus*	Slate-coloured Grosbeak	BF	O
	Saltator maximus	Buff-throated Saltator	OP; FE	O, V
	Saltator coerulescens	Greyish Saltator	OP; FE	S, O, V
	Cyanoloxia cyanoides	Blue-black Grosbeak	BF	S
Parulidae (1)	*Phaeothlypis fulvicauda*	Buff-rumped Warbler	BF	O
Icteridae (5)	*Psarocolius decumanus*	Crested Oropendola	BF	O, V
	Psarocolius bifasciatus	Olive Oropendola	BF	O
	Cacicus cela	Yellow-rumped Cacique	OP; BF	O, V
	Molothrus oryzivora	Giant Cowbird	OP; BF	O
	Sturnella militaris	Red-breasted Blackbird	OP	S, O, V
Fringillidae (1)	*Euphonia chrysopasta*	White-lored Euphonia	BF	S

Species accounts

BLUE-HEADED MACAW *Primolius couloni*

Restricted to part of the Inambari centre of endemism (Haffer 1978, Cracraft 1985). Tobias & Brightsmith (2007) recently reviewed all records from south-west Amazonia, finding that, in Brazil, almost all records are from Acre. During the present study, MPDS observed at least six flying over pastures or perched on palm trees at the edge of the forest. The species' vocalisations were recorded twice. *P. couloni* is probably relatively common in eastern Acre.

PAVONINE CUCKOO *Dromococcyx pavoninus*

Known in Acre from the upper rio Juruá (Whittaker *et al*. 2002) and the Rio Acre Ecological Station in the east of the state. *D. pavoninus* was heard in forest almost daily, and was relatively common in the middle strata. On 13 November 2006, one was collected in the undergrowth of bamboo forest after responding to playback. This specimen (MPEG 61235) is the first from Acre.

RUFOUS-CAPPED NUNLET *Nonnula ruficapilla*

Recorded previously in Acre solely from the upper rio Juruá (Whittaker *et al*. 2002) and on the upper rio Acre in the east of the state. Our record at Jarinal is the fourth for the state of Acre, and a specimen (MPEG 61249), collected in the undergrowth of the bamboo forest, is only the second from the state.

YELLOW-BILLED NUNBIRD *Monasa flavirostris*

Records from Acre come from the rio Juruá in the west (Whittaker *et al*. 2002) and the Purus basin in the east (Rasmussen *et al*. 2005, Aleixo & Guilherme 2008). We observed the species at the edge of bamboo forest and in the canopy. It appeared to be segregated ecologically from other *Monasa*, at least partially, through its preference for the canopy rather than the understorey. A specimen (MPEG 61244) was collected on 12 November 2006, and is the first from Acre, and only the third example of this species in the Goeldi Museum collection.

RUFOUS-HEADED WOODPECKER *Celeus spectabilis*

First reported from Acre by Whittaker & Oren (1999) based on observations in *tabocais* along the upper rio Juruá. At our study site, several were observed foraging among bamboo stems. We collected three birds responding to playback on 12 November 2006. On 15 November, a fourth specimen was mist-netted. These four, two females (MPEG 61254–55) and two males MPEG 61256–57), increases the number of specimens of this taxon in the Goeldi Museum collection to seven, all from Acre. Kratter (1997) considered the species a 'near-obligate' inhabitant of lowland bamboo forest in south-west Amazonia.

BAMBOO ANTSHRIKE *Cymbilaimus sanctaemariae*

First recorded in Acre by Pierpont & Fitzpatrick (1983), based on one collected by J. Hidasi, in 1968, in the vicinity of the city of Rio Branco (Seringal Nova Empresa). The species was subsequently recorded on the upper rio Juruá (Whittaker & Oren 1999, Whittaker *et al*. 2002). It has an easily recognised song and is very common in forest undergrowth. *C. sanctaemariae* was frequently observed following mixed-species flocks of insectivores in the understorey. Three were collected, a female (MPEG 61295) and two males (MPEG 61293–94). This is another 'near-obligate' inhabitant of south-west Amazonian bamboo forests (Kratter 1997).

ORNATE ANTWREN *Epinecrophylla ornata*
Recorded throughout most of Acre (Whittaker *et al*. 2002, Guilherme 2007). Several were observed foraging in mixed-species flocks in the undergrowth of the *tabocal* at the study site. We collected four specimens, three males (MPEG 61346–48) and a female (MPEG 61345). According to Kratter (1997), the species is a 'facultative' resident of bamboo forest in south-west Amazonia.

STRIATED ANTBIRD *Drymophila devillei*
Whittaker & Oren (1999) presented the first records from Acre, from the upper rio Juruá, in a riparian (*várzea*) forest with bamboo. It was subsequently recorded at Catuaba Experimental Ranch in the east of the state (Rasmussen *et al*. 2005). We collected two birds (MPEG 61349–50) that responded to playback. According to Kratter (1997) and Parker *et al*. (1997), Striated Antbird is an 'obligate' resident of bamboo forest. In the study area, the species used the upper stratum of the *tabocal*, and was observed within mixed-species flocks of understorey insectivores.

MANU ANTBIRD *Cercomacra manu*
Known from Acre on the basis of a specimen collected on the upper rio Juruá (Whittaker & Oren 1999), Manu Antbird was recently recorded at the Rio Acre Ecological Station (A. Aleixo *in litt*. 2009). Our two specimens from Jarinal (MPEG 61336–37) are the first from the east of the state. The species is another 'obligate' resident of bamboo forest (Kratter 1997, Parker *et al*. 1997).

YELLOW-BREASTED WARBLING ANTBIRD *Hypocnemis subflava*
The first confirmed record in Acre was by B. M. Whitney in 1997 at Catuaba Experimental Ranch (*cf*. Isler *et al*. 2007) based on visual observations and voucher sound-recordings. It was also recorded in 2001 by EG in the Zoobotanical Park of the Federal University of Acre (UFAC). However, the first Brazilian specimens of this taxon were collected as recently as August 2005 and February 2006, at Rio Acre Ecological Station (Aleixo & Guilherme 2008). On 16 November 2006, we collected a male (MPEG 61308) in the understorey of bamboo forest. The species is common in eastern Acre, and appears to replace Yellow-browed Antbird *H. hypoxantha* geographically, with the latter species apparently restricted to the west of the state, i.e. the Juruá basin (EG pers. obs.).

WHITE-LINED ANTBIRD *Percnostola lophotes*
The first records for Acre involved specimens taken on the upper rio Juruá (Whittaker & Oren 1999) and subsequently at Rio Acre Ecological Station (Aleixo & Guilherme 2008). Our specimen, MPEG 61317, collected in *tabocal* at Jarinal is the first for eastern Acre. It is a 'near-obligate' resident of bamboo forest in south-west Amazonia (Kratter 1997).

GOELDI'S ANTBIRD *Myrmeciza goeldii*
Occurs throughout Acre (Whittaker & Oren 1999, Guilherme 2001, Whittaker *et al*. 2002, Aleixo & Guilherme 2008). This species has an easily recognised song, and it was sound-recorded daily during our survey. Four specimens, two females (MPEG 61311–12) and two males (MPEG 61314–15), were mist-netted in the understorey of *tabocal*. Goeldi's Antbird is a 'near-obligate' resident of bamboo forests in south-west Amazonia (Kratter 1997).

RED-BILLED SCYTHEBILL *Campylorhamphus trochilirostris*

Occurs throughout Acre (Whittaker *et al*. 2002, Guilherme 2007). We mist-netted four specimens, all males (MPEG 61273–76), in the understorey of *tabocal*. According to Kratter (1997), the species is a 'facultative' resident of bamboo forest in south-west Amazonia.

CHESTNUT-THROATED SPINETAIL *Synallaxis cherriei*

The only two prior records from Acre were visual and vocal (Whittaker *et al*. 2002, Aleixo & Guilherme 2008). On 23 November 2006, we mist-netted a male (MPEG 61278) in the midstorey of bamboo forest. This is the first specimen from Acre.

PERUVIAN RECURVEBILL *Simoxenops ucayalae*

The first specimens from Acre were collected on the upper rio Juruá (Whittaker & Oren 1999). Subsequently, a specimen was taken at Rio Acre Ecological Station by Aleixo & Guilherme (2008). A female (MPEG 61287), collected during the present study in dense *tabocal* near the Jarinal road, is the second specimen from eastern Acre, and one of only six specimens from localities across the state. At Jarinal, the species was observed twice in association with a mixed-species flock of understorey insectivores, and responded to playback. This is a 'near-obligate' resident of bamboo forest in south-west Amazonia (Kratter (1997).

BROWN-RUMPED FOLIAGE-GLEANER *Automolus melanopezus*

Recorded at both the western (Whittaker *et al*. 2002) and eastern (Aleixo & Guilherme 2008) extremes of the state of Acre, but only two specimens are available, making the female (MPEG 61280) mist-netted at Jarinal on 22 November 2006 only the third from Acre. Another 'near-obligate' resident of bamboo forest in south-west Amazonia (Kratter 1997).

RUFOUS TWISTWING *Cnipodectes superrufus*

This recently described species (Lane *et al*. 2007) was collected at the UFAC Zoobotanical Park by EG in 1998, but was misidentified as Brownish Twistwing *C. subbrunneus* (Tobias *et al*. 2008). We collected one in the undergrowth of *terra firme* bamboo forest at Jarinal on 20 November 2006, when it responded to playback. The male specimen (MPEG 61351; Fig. 2) is only the third for Brazil, and the first away from UFAC (Tobias *et al*. 2008).

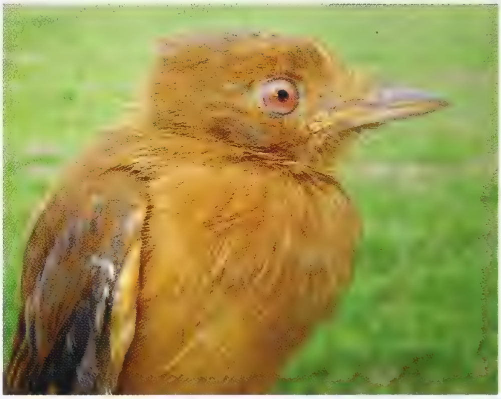

Figure 2. Rufous Twistwing *Cnipodectes superrufus*, a recently described species associated with bamboo forest in south-west Amazonia; this is the first image of a live *C. superrufus* from Brazil (Edson Guilherme)

LONG-CRESTED PYGMY TYRANT *Lophotriccus eulophotes*

Occurs throughout the state of Acre (Whittaker *et al*. 2002, Rasmussen *et al*. 2005, Guilherme & Dantas 2008). A male (MPEG 61327) was collected in *tabocal* on 19 November 2006, after responding to playback.

FLAMMULATED BAMBOO TYRANT *Hemitriccus flammulatus*

Occurs throughout the state of Acre (Whittaker *et al*. 2002, Guilherme 2001, 2007, Aleixo & Guilherme 2008). It was the only bamboo forest species of which no specimens were collected during the present study. However, we found it common at Jarinal, and documented its presence with sound-recordings.

LARGE-HEADED FLATBILL *Ramphotrigon megacephalum*
Occurs throughout Acre (Whittaker *et al.* 2002; EG pers. obs.). Two males (MPEG 61328–29) were collected, on 13 and 20 November 2006, in the understorey of *terra firme* bamboo forest. According to Kratter (1997), the species is a 'near-obligate' resident of lowland bamboo forest in south-west Amazonia.

DUSKY-TAILED FLATBILL *Ramphotrigon fuscicauda*
Occurs throughout Acre (Whittaker *et al.* 2002, Guilherme *et al.* 2003, Guilherme 2007). Two specimens, a male (MPEG 61330) and an unsexed individual (MPEG 61331) were collected in bamboo forest at Jarinal. This species is a 'near-obligate' resident of lowland bamboo forest in south-west Amazonia.

SULPHUR-BELLIED TYRANT-MANAKIN *Neopelma sulphureiventer*
Occurs throughout Acre (Whittaker & Oren 1999; EG pers. obs.). We collected a male (MPEG 61358) mist-netted in bamboo forest.

Final considerations

During the expedition reported here, we recorded and collected almost all of the south-west Amazonian bird species considered to be bamboo forest specialists. We believe that our data will contribute not only to a better understanding of these species' geographic ranges, but also to the importance of the region's bamboo forests for conserving the local avifauna in this unique region of outstanding biological richness.

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A cat among the pigeons! Known specimens and supposed distribution of the extinct Solomons Crested Pigeon *Microgoura meeki* Rothschild, 1904

by W. John Tennent

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Summary.—Based on unpublished letters written by A. S. Meek to the staff of Rothschild's Museum at Tring, the collection of the only known specimens of the Solomons (or Choiseul) Crested Pigeon *Microgoura meeki* Rothschild, 1904, on the island of Choiseul is discussed. The question of whether six or seven adults were collected by Meek is resolved, and notes are provided on the habitat and supposed distribution of the bird, which is now considered extinct. Details are given of subsequent searches for *M. meeki*, in particular by the Whitney South Sea Expedition, in the form of extracts from unpublished journals held in the Department of Ornithology archives at the American Museum of Natural History, New York. The unique egg, a skin of *M. meeki*, sections from Meek's letters, and a Whitney map showing the areas of Choiseul that were searched, are illustrated for the first time.

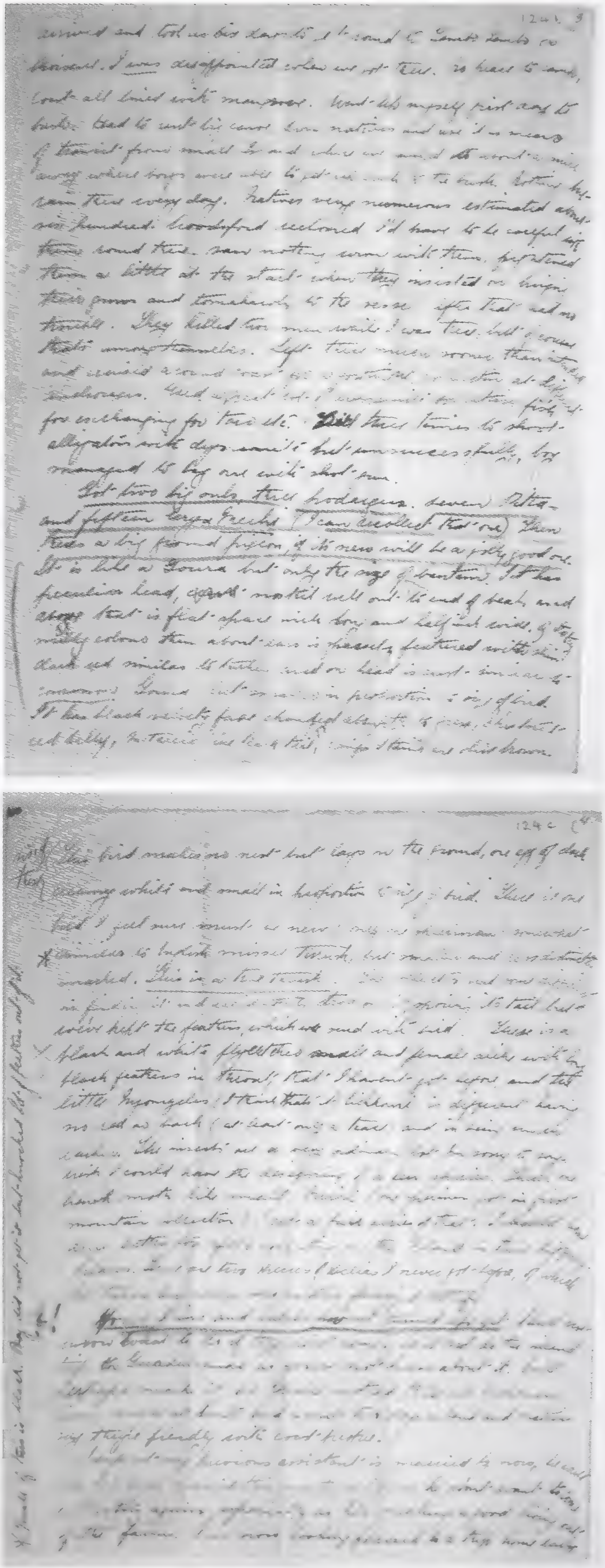
Pigeons (Columbidae) have not been the most fortunate of birds in their contacts with people, indeed the association has often been catastrophic. The most famous example of extinction (the Dodo *Raphus cucullatus* from Mauritius in the late 17th century) and the massacre of billions of Passenger Pigeons *Ectopistes migratorius* in the continental USA less than 100 years ago are widely known. A lesser known pigeon whose fate may also be laid—albeit indirectly—at the door of *Homo sapiens* is the Solomons (or Choiseul) Crowned Pigeon *Microgoura meeki* Rothschild, 1904, which Mayr & Diamond (2001: 37) regarded as 'the most spectacular endemic bird of Northern Melanesia'.

In transcribing letters written by Albert Stewart Meek (1871–1943) between 1894 and 1931 to the staff of Walter, Lord Rothschild's Museum at Tring in Hertfordshire, references were noted regarding his collection of *M. meeki*. The correspondence consists of *c*.500 handwritten letters, a high proportion of which were written by Meek in the field. In addition to providing an insight into Meek's mindset, and the very real hardships associated with 19th and early 20th century collecting in some of the most remote places on the globe, they contain a wealth of field data relating to a variety of natural history material. The correspondence is rather frustrating, primarily because it is so one-sided. It comprises letters written by Meek to Rothschild and his curators, Ernst Hartert in the case of birds and Karl Jordan on the subject of insects, but copies of replies to Meek were not retained at Tring (the earliest copy of an outgoing letter to Meek is dated January 1911). This paper deals with some confusion in the literature regarding how many specimens of *M. meeki* were sent to Tring by Meek, subsequent searches for it, and the supposed distribution of this distinctive bird, considered by most ornithologists—almost certainly correctly—to be extinct.

The discovery of *Microgoura meeki*

Like its collector Albert Stewart Meek, most often referred to simply as 'A. S. Meek', but cited for example as 'Alfred Stanley Meek' by Parsons (1998) throughout his book, the pigeon has been provided with different names in the literature. The most frequently used common names are Solomons Crested Pigeon, Solomon Islands Crested Pigeon or Choiseul Crested Pigeon, but it has also been referred to as Choiseul Pigeon (e.g. Stattersfield & Capper 2000), Crested Choiseul Pigeon (Mayr 1945), the 'Crested Pigeon of the Solomons' (Greenway 1967) and Dwarf Goura (Tyler 1979). Ferguson-Lees & Faull (1992) declared it was 'better known as Meek's Pigeon', although I have not noted this name used elsewhere—other than informally in the Whitney South Sea Expedition journals (see below). A. S. Meek was one of the most productive of Rothschild's professional natural history collectors and he is well known to entomologists for the enormous number of new insects he discovered, including the largest butterfly in the world: *Ornithoptera alexandrae* Rothschild, 1907 (Ackery 1997, Tennent in press). Ornithologists remember him for his prolific collections of birds, which included *Microgoura meeki*.

Meek's first mention of what was soon to be described as *M. meeki* appears in a letter to Ernst Hartert dated 18 January 1904 (Meek 1904a; Figs. 1–2): ' . . . there's a big ground pigeon, if it's new will be a jolly good one. It is like a Goura but only the size of a bantam. It has peculiar head, nostril well out to end of beak, and above that is flat space inch long



Figures 1–2. Meek's letter giving the first details of what was to be described by Rothschild as *Microgoura meeki* (Meek, 1904a: 3–4) (© The Natural History Museum, London).

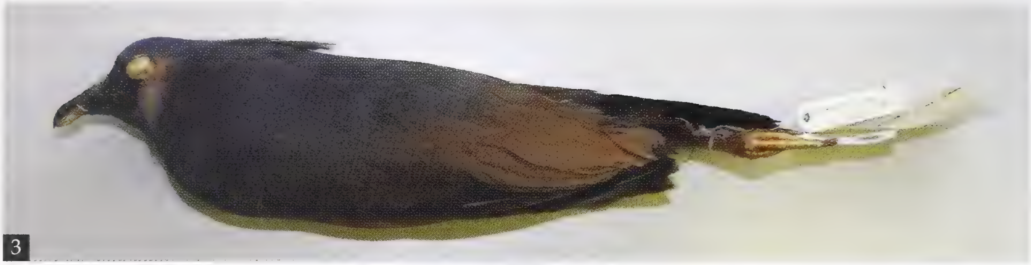
and half inch wide, of slatey milky colour then about ears is sparsely feathered with chin dark red similar to turkey and on head is crest similar to common [original emphasis] Goura but smaller in proportion to size of bird. It has black velvety face changed abruptly to grey, chestnut red belly, metallic blue black tail, wings I think are olive brown. This bird makes no nest but lays on the ground, one egg of dark creamy white and small in proportion to size of bird.'

Very shortly thereafter, this highly distinctive pigeon was described by Rothschild (1904) as a new species in a monotypic genus *Microgoura* and, so far as is known, the bird has never been seen since, at least by ornithologists. Not unusually for the time, the number of specimens available to Rothschild is not mentioned in the type description, other than to say that both sexes were present, together with an egg (Rothschild 1904). The birds' habitat was given as 'Choiseul Island, Solomon Islands', and the holotype was said to have been collected by Meek on 7 January 1904 (according to the accompanying data label, the Tring paratype ♂ [Fig. 4] was taken two days earlier). Considering the specimens were taken in January, some distance from the capital of the Solomon Islands (at that time on Tulagi Island, part of the Florida group), they reached England quite quickly, and Meek said in a letter less than six months later (Meek 1904b): 'Your [letter] of tenth May duly to hand . . . you do not mention getting egg (cream colour) of the crested pigeon . . . '. Since then, there have been at least four concerted efforts to rediscover *M. meeki*—by members of the Whitney South Sea Expedition in 1927 and 1929 (especially the latter), and more recently by Jared Diamond (Diamond 1987) and the late Shane Parker, an Australian ornithologist with a particular interest in the pigeon (Parker 1967a,b, 1972). Historical and modern literature raise questions as to how many specimens of *M. meeki* were collected by Meek in 1904, and on the distribution of the pigeon.

How many specimens of *Microgoura meeki* were collected?

Despite an unequivocal statement by Rothschild & Hartert (1905: 247) that ' . . . Mr Meek sent seven specimens, of which six are in the Tring Museum . . . 3♂♂, 3♀♀, Choiseul, January 1904 . . . an egg was taken on January 10th', doubt has been expressed as to whether there were seven specimens or only six. Parker (1967a) said: ' . . . still only known from seven skins (five in the American Museum of Natural History, one in the British Museum [Natural History], one untraced) and an egg (in the B.M. [N.H.]) . . . ' and added (Parker 1967b: 129): 'Many specimens not retained by Rothschild were passed on to such dealers as Gerrard and Janson; this may have been the fate of the missing seventh specimen of the Solomons Crowned Pigeon . . . whereas the majority of Meek's bird skins passed with the Rothschild collection to the American Museum of Natural History, New York, in 1932, a few came *via* Gerrard to the British Museum (Natural History), London . . . '. However, five years later Parker (1972: 25) mentioned that 'Meek, in a letter to Hartert from Gizo dated 18 January 1904, wrote that he had collected six specimens . . . '. This was repeated by Fuller (2000: 185–186) who stated ' . . . in a covering letter dated 18 January, Meek wrote . . . that six specimens had been sent. Interestingly, Rothschild and Hartert recorded that seven were actually received; the seventh specimen is probably a cream-coloured egg that still exists at the museum . . . five of the skins were eventually sold . . . to The American Museum of Natural History, New York . . . and the sixth passed into the collection of The Natural History Museum, London'.

The question of what Meek himself said is easily resolved. His letter dated 18 January 1904 (Meek 1904a) is one of his longer missives, comprising six pages and written in at least two sections ten days apart (the last section is dated 28 January). Meek was in expansive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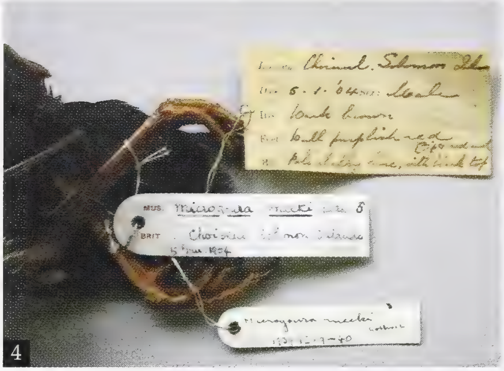
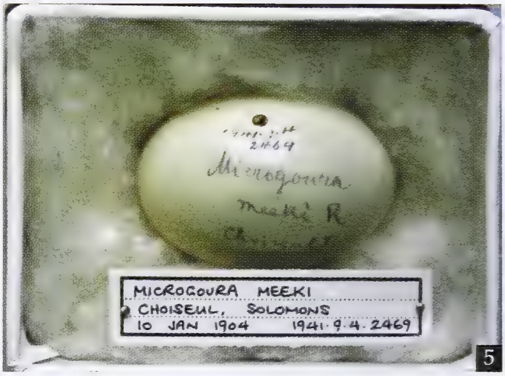

Choiseul. Solomon Is.
Male
Dark brown
Microgoura meeki
Choiseul Solomon Islands
Microgoura meeki
4


2469
Microgoura meeki R
MICROGOURA MEEKI
CHOISEUL, SOLOMONS
10 JAN 1904 1941.9.4.2469
5

Figures 3–4. Male paratype of Solomons Crested Pigeon *Microgoura meeki*, held at The Natural History Museum, Tring (© The Natural History Museum, Tring).

Figure 5. The unique egg of Solomons Crested Pigeon *Microgoura meeki*, held at The Natural History Museum, Tring (© The Natural History Museum, Tring)

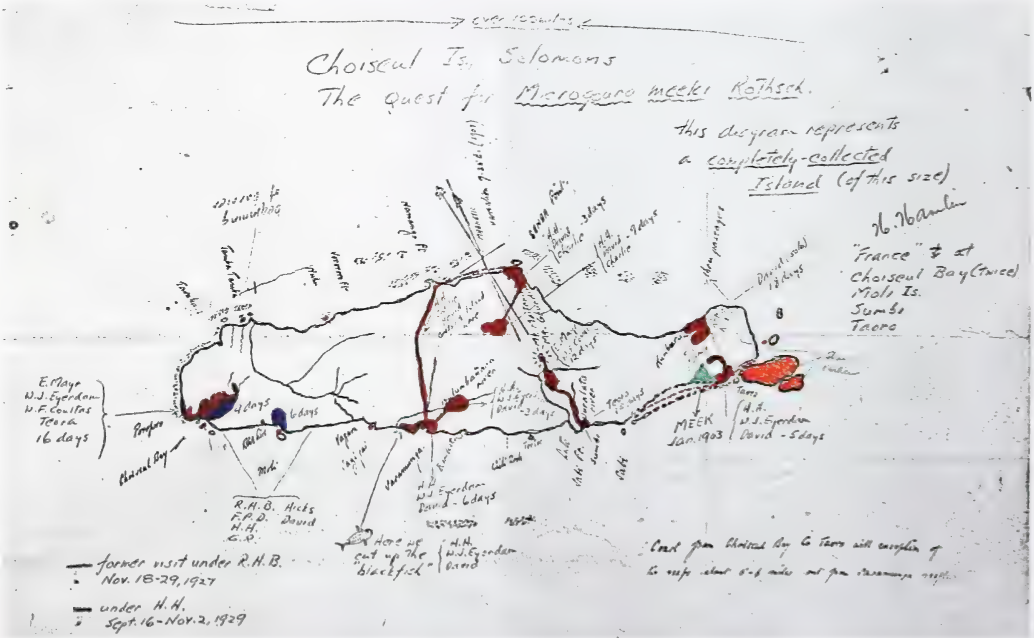

Choiseul Is. Solomons
The Quest for Microgoura meeki Rothsch.
this diagram represents
a completely-collected
Island (of this size)
H. Hamlin
"France" at
Choiseul Bay (twice)
Moli Is.
Sumbi
Taoro
E. Mayr
W.J. Eyerdam
W.F. Coultas
Teora
16 days
Choiseul Bay
4 days
6 days
R.H.B. Hicks
F.P.D. David
H.H.
G.R.
H.H.
W.J. Eyerdam
David - 6 days
H.H.
W.J. Eyerdam
David - 3 days
Here we cut up the "blackfish"
H.H.
W.J. Eyerdam
David
H.H.
David
Charlie - 3 days
H.H.
David
Charlie - 9 days
David (solo)
18 days
MEEK
Jan. 1903
H.H.
W.J. Eyerdam
David - 5 days
Taoro
former visit under R.H.B.
Nov. 18-29, 1927
under H.H.
Sept. 16-Nov. 2, 1929

Figure 6. Map of Choiseul Island, showing collecting localities of the Whitney South Sea Expedition (Hamlin 1930) and the subsequent search by Shane Parker (courtesy of the Department of Ornithology, American Museum of Natural History, New York)

mood, and discussed his health, money, equipment, future expedition plans, and collection of birds and insects from Choiseul and elsewhere. Many of Meek's letters have words or sections annotated or underlined by the staff at Tring, often in coloured crayon, and the section in this letter noting the 'new pigeon' is underlined in red (Fig. 1). There is also a note in red ink on the first page of the letter 'Please return soon for answer'. On the top of the fourth page (Fig. 2), next to the final part of the entry, is written 'six of these'. This is clearly in Meek's handwriting, and although it is next to Meek's description of the egg, and does not actually state 'I collected six specimens' in so many words (*cf*. Parker 1972), it can only refer to the number of birds sent. Subsequent authors have varied in their statements: some mentioning six specimens, others seven, and others six or seven.

Miriam Rothschild (1983: 158) noted that Walter agreed to pay Meek for 'six specimens of every species [of bird] at [six shillings and six pence = 37.5 pence in modern currency] each, with a bonus of £4 for every new species', and this is confirmed in Meek's correspondence, although there is evidence there that additional birds were sometimes accepted on the basis that Rothschild could and would use unwanted material for exchange. Meek had a well-established agreement with Rothschild and his curators that insects surplus to requirements would be released to Oliver Janson for sale, and the same arrangement existed with natural history dealer Edward Gerrard in respect of bird skins. In the case of *Microgoura meeki*, Rothschild retained all of the skins Meek sent him but later sold the bulk of his bird skins—some 280,000 specimens—to the American Museum of Natural History (AMNH), New York, retaining 4,000 skins that he wished to bequeath in due course to what is now The Natural History Museum (BMNH) (Robert Prŷs-Jones pers. comm.). The male *M. meeki* (Fig. 3) now in the BMNH (Tring) is the sixth of Rothschild's specimens. The unique egg (Fig. 5) is rather dark in colour (creamy) compared to the eggs of associated taxa, and is also in the BMNH at Tring.

The AMNH (internet site accessed March 2009) lists five specimens (AMNH 616456–460), the last associated with a skeleton. In March 2009 AMNH *Microgoura* holdings were very kindly examined by Mary LeCroy, who confirmed the presence of five skins and a partial skeleton, removed from the skin more recently, associated with AMNH 616460. Beyond the statement by Rothschild and Hartert, there is no evidence that there were ever more than six skins extant, nor any indication that more than five specimens were offered to, or received by, the AMNH. Meek's comment in the margin of his letter can be taken as definitive. Unusual though it may be—for Rothschild was renowned for attention to detail and for his prodigious memory—it seems that he, and Hartert, made a mistake.

The Whitney South Sea Expedition search

Unpublished Whitney South Sea Expedition journals held in the Department of Ornithology archives at the AMNH provide a fascinating insight into the search for *M. meeki* some 25 years following its discovery and raise reasonable doubt as to reliability of locally obtained data concerning the bird. The journal sections seen are typed, and include a map prepared by Hannibal Hamlin (Hamlin [1930]) entitled ' . . . The Quest for Microgoura meeki . . . ', reproduced here (Fig. 6) with annotations made by Mary LeCroy to show where the late Shane Parker subsequently investigated offshore islands close to the southern coast of Choiseul in the 1960s. Hamlin's map appears to be based on one drawn by Coultas (1929–30: unnumbered page between 225 and 226). Several members of the expedition referred to the pigeon, including Rollo Howard Beck who, as leader of the expedition in 1927, noted in an entry dated 22 November 1927 (Beck 1923–28: 280) 'went up into a wild forest to look for ground pigeons, but found none' and on 29 November (Beck 1923–28: 281) 'The last four days we have been at Choiseul Bay but found no *Microgoura* . . . '. Guy

Richards, another member of the expedition's 1927 visit to Choiseul, added (Richards 1927–28: 124) 'The search for the ground pigeon that Meeks [*sic*] reported came to no result . . . the dove family were hard to locate, and it was on only one day that any of us ever heard them call' and later (Richards 1927–28: 129–130) 'Our stop in Choiseul Bay was presumably for another try at Meek's crested pigeon. After going up both rivers, one or more of us several times, we all had the same story to report, no birds . . . our stay in Choiseul Bay from the collecting standpoint was a rank failure . . . the quest for the crested pigeon proved as fruitless here as it had at Moli'.

The most detailed Whitney account was provided by Hannibal Hamlin. Regarding the visit to Choiseul Bay on 22 November 1927, he noted (Hamlin 1927–28: [90]) 'The crested ground pigeon (Microgura [*sic*] meeki) remains a mystery bird'. In 1929, Hamlin, having replaced Beck as expedition leader, made a concerted effort to rediscover *Microgoura*; in a journal entry for 15 September 1929, he wrote (Hamlin 1928–30: [99]–[100]): ' . . . [we dropped] anchor in the northern corner of Choiseul Bay . . . [we] spent from November 25–28, 1927 in this anchorage . . . after six days at Moli Is., about 15 miles down the coast . . . we failed to find any trace of the Microgoura meeki Rothsch. . . . it is my idea that Meek spent his time somewhere around the southern extremity of Choiseul; and it is there that we shall have to go in order to get the bird . . . my intention was to go to Bambata where we can get all the information needed, and proceed down the southern coast as we found anchorages and, if we did not get the bird, to continue right around the island and up the northern coast . . . Choiseul Bay is known as a safe anchorage and from here we can reach almost any part of Choiseul by launch. The difficulty will be to learn whether the pigeon has a localized habitat or distribution, whether or not Meek collected it at the southern end, etc. The natives I have questioned about the Microgoura, all from the vicinity of Choiseul Bay, have given doubtful evidence. One or two seem to know the bird and are positive of its presence. All reports, however, are vague and are given in a favorable manner more to please the inquisitor than anything else.'

Two days later, on the morning of 17 September, aboard a Chinese trading vessel en route for Senga on the north-west coast, he wrote (Hamlin 1928–30: [101], [103]): ' . . . upon short notice I had little opportunity to formulate any accurate plans or prognostications. We hope to find new terrain that harbors our pigeon, at least we will acquire some definite information. The rest of the staff must make the best of the country around Choiseul Bay . . . ', and a few days later, ' . . . the Microgoura is probably a forest bird . . . numerous nut-harvesters questioned about the bird; all proved indefinite but cited a crested pigeon as 'kukuwonzo'. It answers to the characteristics of the Microgoura as given by me, the natives say 'Yes' to everything. But I suspect it is the long-tailed crested arboreal pigeon because the call which they imitate is the same . . . the teacher brought some boys along and we had more talk about birds. Again, they do not seem to know the Microgoura. It is best that we hunt around here for a few days more, and if we do not find it make a camp inland. I am informed that there are still some bush villages; perhaps the citizens of these can impart something conclusive or useful . . . '.

Hamlin's suspicion that reports of *M. meeki* probably referred not to that species but to the Crested Cuckoo-Dove *Reinwardtoena crassirostris* Gould, 1856, was confirmed to his satisfaction on 25 September 1929 (Hamlin 1928–30: [105]): 'I crossed several deep ravines and unexpectedly came upon a nutting camp of true bush people from Saralata, one of the few surviving bush villages. Only one man could speak pidgin and he could give me no information of the Microgoura, which I certainly expected, either through lack of understanding or ignorance. As it happened, luckily, a crested pigeon started calling close at hand while we were talking. We promptly stalked the unmistakable call and I shot it. He brought it to me, naming it 'kukuwonzo', which proves my suspicion correctly that the Senga natives have taken my description of the ground bird to be that of this crested tree pigeon (Turcaena crassirostris, old nom.), or 'kea' pigeon. Further inquiry with evidence in hand evinced no additional information'.

Jared Diamond had a similar experience when he visited Sasamunga in 1974 to search for *Microgoura*. He was told of a crested pigeon that was rarely encountered, referred to by a guide as 'kuwanjo'. A solitary pigeon heard and then seen by Diamond and his guide was *R. crassirostris*, which the guide proclaimed to be 'kuwanjo' (J. Diamond *in litt*. 2009). As Gibbs *et al*. (2001: 418) recently pointed out, *R. crassirostris* is generally grey with a long crest, and this has probably perpetuated confusion in local folklore regarding the supposed continued existence of *M. meeki*. Hamlin's enquiries continued. Writing at Sasamunga on 7 October 1929 he said (Hamlin 1928–30: [109], [110]): 'Enquiried [*sic*] about the Microgoura resulted in some new information: the bird they know here from my description is called 'kukuru-ni-loua' (lit. pigeon-belong-ground), and is recalled only by the older men, who say that cats, introduced since the advent of the Mission, have destroyed so many that they cannot remember when one was last seen in the bush . . . the big river basin we traversed yesterday is said to have been a good place for them. The birds were easily caught by the boys in their hands after they had found a low-branched tree in which the pigeons roosted in twos and threes and fours by noting the manure on the ground underneath; they would simply wait their opportunity and seize them while sleeping. No one could recall Meek or where he worked on Choiseul'.

Some further light is thrown on the name 'kukuru-ni-loua' by Jared Diamond who, on his visit to Sasamunga, was told of another large pigeon called 'kurulilua'. An elderly Sasamunga inhabitant informed Diamond that the Whitney Expedition had collected a specimen of 'kurulilua', and since the expedition diaries confirm collecting their only specimen of the large ground-dwelling Yellow-legged Pigeon *Columba pallidiceps* at Sasamunga, it is quite possible that the local name 'kukuru-ni-loua' or 'kurulilua' refers to *C. pallidiceps*, not *M. meeki* (J. Diamond *in litt*. 2009). On 11 October (Hamlin 1928–30: [112]) continued: 'Left the ship . . . en route we cabled [*sic*: called] at several villages where I made enquiries about Meek's bird. Only one seemed to know it—ToiToi. They confirmed what I had been told at Sasamunga—that they had not seen the bird of late and that cats gone wild had been known to make prey of it . . . '.

Almost a week later, still with no sign of *Microgoura meeki*, and with expedition time running out (Hamlin 1928–30: [114]–[115]): 'October 16. With seven carriers and ourselves loaded we climbed the range just behind the coast and dropped into the extensive flats flanking the Kolumbanara [= Kolombangara] river . . . according to the older men they used to catch the Microgouras in this locality . . . October 17. Nine of us out in various directions. Those without guns will search for roosting places. Rain fell continuously after 10 o'clock and all returned to camp by 5 with no report of success . . . October 18. All out with similar intent . . . the natives are discouraged about the Microgoura; no sign of its presence has been found. Many are in the bush looking for it since I posted a reward of five pounds for a live one. This extravagance is safe; the species is probably extinct. Only the rarest kind of luck could bring one into the collection . . . '.

The promise of such largesse failed to provide any reliable evidence of *M. meeki*'s continued existence (Hamlin 1928–30: [118]–[122]): 'October 24. . . . we have about given up the Microgoura, although some local boys are still said to be in the bush hoping to find one in order to be able to claim the five pound bounty . . . I learn that the citizens of Tauro village recall that Meek worked in that vicinity. Three of the older men vouched that they had seen the Microgoura this year, one man in June, and two others just a few months ago while nutting. Can I believe them? . . . October 26. Called at Sambi village and anchored at Rorivai (Roramboko) for the night . . . propaganda about Meek's pigeon was spread at both these places. Again, the older inhabitants recognized the description of the bird and remarked on its beauty; but one has not been seen or heard lately. They imitate the call by a low trilling sound . . . October 28. . . . at Tauro village which is situated on a bluff fifty feet high on the very point of the mainland of Choiseul, a deep water passage dividing it from Rob Roy I., just across the bay . . . the few people in the village can impart no information about the Microgoura; they speak no pidgin and we shall have to hunt for ourselves until the men who told us they had seen it this year return from Sasamunga . . . November 2 . . . the teacher . . . took us by canoe to a big inland river flat where he says the Microgoura was observed this year. Four hunters walked about until dark and saw nothing. Either these gentlemen are awful liars, which I suspect is the case, or the M. meeki Rothsch. is nomadic because of the pussy cats gone wild. Arriving back at the village . . . we found the whale boat of the France waiting for us; the ship anchored about two miles up the coast this afternoon. So we embarked, giving up the search for the phantom ground pigeon . . . '.

Mention here of the name 'pussy cat' rather than plain 'cat' is not as strange as it might now seem: many Solomon Islanders still refer to the animal as 'pusscat', presumably as a result of having been given this name for an animal they had no experience of prior to the arrival of missionaries. Even as the expedition prepared to leave Choiseul, local hunters continued—probably erroneously in the opinion of Hamlin—to report the presence of the bird. On 3 November further reports were received (Hamlin 1928–30: [122]–[123]). 'November 3 . . . a canoe came alongside in the late afternoon with boys returning to Kumburu village which is on the other end of the trans-Choiseul passage from Tauro. They say they have seen the Microgoura this year and are positive one only has to go to their place to get it. The older ones know of Meek and can point out his camp in the bush . . . November 4. I decided last night to leave David here on Choiseul to have a final stab for this rumor of the Kumburu boys. He will be able to put in three weeks before the steamer takes him from Gizo to Tulagi . . . if these natives are not liars, which they are, he might crown our discouraging search with eleventh-hour success . . . '.

Much of Hamlin's account appears in lesser detail in journals compiled by other expedition members, and the lack of success of this final search for *M. meeki* was recorded by Walter Eyerdam (Eyerdam 1929–30: 7–8): 'At Bambatani we continued our hunting and had a lot of hunters out but no sign of a Microgoura pigeon. Some of the older natives know the bird and one of the newcomers to the big religious meeting that was in progress, declared that he had caught two of them about a year before near Tahro on Rob Roy Island, adjacent to the south end of Choiseul island. This locality was very near to the spot where Meek and Eichhorn had secured their specimens, so we still laid out hopes of bagging one or two in that place. We were informed by the natives that the bird had been practically exterminated by pussy cats gone wild that the Mission had first brought to Choiseul Island, a few years before. This is quite likely the case and we are quite convinced that there are no more Microgoura pigeons left. They can fly but little, have permanent roosts at night, are easily found and especially the young would be very easy prey for cats, dogs and pigs . . . Mr. Hamlin and David and I went . . . to Tahro where we hunted over a week. This was Meek's old hunting locality and remains of his camp could still be seen in the bush at one place . . . Mr. Hamlin had not yet abandoned hope . . . so he left David, our best hunter and bird skinner, to work further inland and to hunt on the mainland of Choiseul. About three weeks later, David joined us in Tulagi, with a good few birds but no Microgoura. Over three months had been spent on Choiseul at an expense of about 60 dollars per day. The primary object [in visiting Choiseul] was to get Microgoura . . . '.

Supposed distribution of *Microgoura meeki*

Many years later—after the 1927 Whitney Choiseul visit, but before that in 1929—Meek stated in a letter to Rothschild (Meek 1929): 'I met a man in Sydney a few months ago who said he was collecting for a Mr Whitney (I think he said), and wanted to know the exact spot where I'd taken the ground pigeon (Microgoura meeki). He'd already been thereabouts a long while. When I told him he was surprised to find he had anchored there and collected for some weeks without dropping across it.'

The man in question was almost certainly Rollo Beck, who had looked for *M. meeki* in the Choiseul Bay area in 1927, and there is little doubt that the type locality of the bird was in that general area, on the north-west coast of the island, although Meek did also collect in other localities. According to his book (1913: 134) Meek regarded his collection of the Solomons Crested Pigeon as highly noteworthy: ' . . . at Choiseul I discovered a very wonderful bird, which the Hon. Walter Rothschild names after me *Microgoura meeki*. It is a kind of crested ground-pigeon and was my best discovery so far in Natural History.'

It is interesting that Meek made no such claim in any of his letters, and that although the statement may be true—he may have made such a comment verbally to the staff at Tring on one of his visits—there is persuasive evidence (research in progress) that the bulk of his book was written by the editor, Frank Fox, from Meek's correspondence, with little or no contemporary input from Meek. However, he made several remarks on the distribution of *M. meeki*. In 1908 (Meek 1908, repeated almost verbatim in his book [Meek 1913: 187]), he said: ' . . . The Microgoura I'm satisfied does not occur [on Bougainville], though I'm told by boys that it's on both Ysabel [Santa Isabel] and Malaita . . . '. And a year later (Meek 1909) he added: ' . . . After doing this trip I should like to revisit the Solomons and collect on Malaita. I know the Microgoura pigeon occurs there, from the natives . . . '.

The alleged occurrence of *M. meeki* on Ramos, a small island some 40 km off the south-east coast of Santa Isabel between that island and Malaita (and far from Choiseul), not mentioned by Meek, was noted recently. Most authors (including those of the current IUCN Red List) agree that *M. meeki* was endemic to Choiseul, and mention of Ramos is thought to stem from Doughty *et al.* (1999). The first author is unable to recall the source for including the island of Ramos (Christine Doughty *in litt.* 2009). Checklists of the birds of Choiseul and Ramos on Mike Tarburton's website in March 2009 listed the 'Choiseul Pigeon *Microgoura m. meeki*' as 'end[emic]' to 'Chois[eul] and Ramos'—the clear implication being that a *meeki* population (on Ramos) was subspecifically distinct from that on Choiseul. Elsewhere on the same website, the bird's range was stated as 'Mak + Ramos'; 'Mak' usually refers to Makira (=San Cristobal). The author of the website agrees that references to San Cristobal and a phenotypically distinct population away from Choiseul were mistakes (M. Tarburton *in litt.* 2009) and the website is to be amended. J. Diamond (*in litt.* 2009) suggests the possibility of confusion with another now-extinct ground pigeon, *Gallicolumba salamonis*, which did occur on both Ramos and San Cristobal.

Although he planned to do so, Meek never visited Malaita, so how seriously should Meek's correspondence be taken as evidence of the occurrence of *M. meeki* on any of the Solomons other than Choiseul? If the bird is extinct, which it almost certainly is (see Diamond 1987), it is impossible now to know the extent of its previous distribution, and Meek was not averse to pressing a case to the staff at Tring in order to support future travel plans. I possess detailed entomological field experience on many of the Solomons, including all those (with the exception of Ramos) where *M. meeki* has either been looked for or has been claimed to occur (Choiseul, Santa Isabel, Malaita), and in many localities the knowledge local people have regarding their fauna is rather patchy. Local knowledge of actual or potential food items is understandably more detailed than knowledge of insects, which are rarely regarded as food. However, I stayed several times in a village on San Cristobal where pigeon was on the menu, and where all pigeon species seemed to be collectively referred to as 'kuru kuru', a common name for pigeons throughout the Solomons in reference to the call. Whilst *Microgoura meeki* might be a highly distinctive pigeon to ornithologists, 'confirmation' of its presence elsewhere by local people may not necessarily relate to this species.

Visiting Malaita is difficult, even now. I visited the island several times when researching butterflies in the Solomons (Tennent 2002), but even in the mid 1990s and early 21st century, failed to venture far inland due to the reluctance or refusal of local guides to do so. Parker (1972: 25) stayed two weeks on western Malaita (probably the Auki region) in 1968, enquiring into the presence or previous existence of *M. meeki* on the island, but found no confirmation that it ever existed there.

That said, a proposed occurrence along the northern Solomons chain, from Bougainville to Malaita, is not far fetched. Within the Solomons archipelago (Bougainville belongs politically to Papua New Guinea), there are distinct areas of endemism (Tennent 2002), notably the New Georgia group and San Cristobal and its satellites, and to a lesser extent Malaita. Numerous insects and terrestrial animals share a distribution of Bougainville, Choiseul, and Santa Isabel, and more than a century ago Rothschild & Hartert (1905: 243) noted that 'the ornis of the islands of the northern chain—*i.e.* the three islands of Bougainville, Choiseul and [Santa] Isabel—is generally alike . . . '. Mayr & Diamond (2001: 40) suggested a former presence of *M. meeki* on Bougainville or Santa Isabel and pointed out that almost all bird species occurring on Choiseul also occur on other islands of what Diamond (1983) postulated from hydrographic depth-contours were previously one long island, referred to as 'Greater Bukida'—Bougainville, the Shortlands, Choiseul, Santa Isabel and the Florida group (possibly also Guadalcanal).

Early 20th century (and subsequent) accounts from local people confirming previous or recent occurrence of *M. meeki* on islands other than Choiseul can only have been based on a verbal description or pictures of skins, and there is no supporting evidence that such accounts were accurate. Despite comprehensive searching by experienced ornithologists on Choiseul and elsewhere, no specimen has been collected since Meek's original short series. Since there are no further specimens of *M. meeki* in existence, and no evidence for its appearance on any other island, claims for its occurrence outside Choiseul can be no more than anecdotal. The only confirmed distribution of *Microgoura meeki* is the island of Choiseul.

Discussion

Despite a relatively recent claim (Day 1981: 38) that 'Modern ornithologists surmise that this pigeon inhabited remote cloud forests in the island's interior . . . ', *M. meeki* seems to have been a coastal forest bird. A high-elevation habitat seems unlikely, if only because it would have been virtually impossible for Meek to venture far inland on Choiseul at the time of his visit in 1904. The source of a further assertion (Day 1981: 38) that 'it seems Meek acquired the birds in trade from a village and consequently did not know exactly what locality they came from . . . ' is also unknown, nor is that of the account by Flannery & Schouten (2001: 108) that 'Meek . . . emerged from the bush unscathed, and with six magnificent chicken-sized pigeons in hand, along with a single egg . . . '. It is most likely—and seems generally accepted—that *M. meeki* was an inhabitant of lowland forests and / or swamps. Parker (1972: 25) received reports of its occurrence 'usually from areas along the sheltered southern coast' and was told by old hunters with memories of the bird that 'it lived in lowland, often swampy, forest, but not in mangroves', contrary to at least one previous report of its occurrence in mangrove. He looked for it on several low-lying swampy uninhabited islands off the southern Choiseul coast without success, and the most recent (but unsupported) report he received in 1968 was of a small roost seen in the early 1940s on the Kolombangara River, south-west Choiseul, an area extensively searched by the Whitney South Sea Expedition some 40 years earlier.

As natives reported to Hamlin, *M. meeki* was a terrestrial pigeon that was said to roost in small groups on low branches, and presence of a roost was conspicuous due to accumulated droppings on the ground below. It reportedly nested on the ground, although this information originated from Meek (1904a: see introduction), and it might be considered optimistic to extrapolate the species' nesting habits from the discovery of a solitary egg. Gibbs *et al.* (2001: 418) were given information to suggest that a terrestrial pigeon (assumed to be *Microgoura*) habitually roosted in pairs in shrubs just a few feet above the ground and that they could easily be located and picked off a branch by hand when they 'sang' in the evening.

Since the only available specimens are those Meek sent to Rothschild, there is no way of knowing the appearance of this remarkable pigeon in life (see comments by Parker 1967a, regarding the crest). Rothschild & Hartert (1905) provided what was in effect an artist's impression of the bird—a hand-coloured lithograph by J. G. Keulemans—which has been reproduced elsewhere (e.g. Fuller 2000), whilst others (Doughty *et al.* 1999, Flannery & Schouten 2001, Day 1981) have prepared their own impressions; the last depicts a rather different bird to the others, most of which conform more or less to the original plate, in that it has a rather pale breast. Fuller (2000: 185–186) stated: '. . . Parker (1967) pointed out that the position of the crest shown in a plate . . . may be misleading and perhaps results from a misinterpretation of Meek's museum skins . . . Meek, to the contrary, remarked on how similar the crest of his new species was to the crests on the more familiar *Goura* pigeons'. A picture of the bird in flight with crest slightly raised (Gibbs *et al.* 2001) provided a further artist's impression.

If *M. meeki* did (or indeed, does) occur on any of the other islands in the Solomons, it is remarkable that it was not discovered prior to Meek's Choiseul visit, and that it has not been seen since. At the time of Meek's visit, the inhabitants of Choiseul were, like those of New Georgia and elsewhere—particularly Malaita—extremely warlike, and a European venturing ashore, or at least any distance inland, most certainly took their life in their own hands. But other travellers visited Choiseul Bay prior to Meek, from French navigator Louis-Antoine de Bougainville in 1768, through Henry Brougham Guppy (who had a keen interest in natural history and made various observations on pigeons: Guppy 1887) and the first resident commissioner of the Solomons, Charles Morris Woodford (Tennent 1999) in the late 19th century. Woodford travelled widely in the Solomons, and would surely have seen or heard of such a distinctive ground pigeon, especially one so easy to approach, in his travels on Choiseul or Santa Isabel.

Island faunas have historically been under significant threat, largely because of limited habitat and the highly specialised nature of island species having evolved in the absence of predators. The non-natural introduction by early Western sailors and travellers of exotic species either accidentally (rats escaping from ships) or deliberately (cats, dogs *etc.*) have most certainly had a significant (usually catastrophic) effect on endemic island faunas, either directly (cats to control rats) or indirectly (competition to other herbivores from goats released to provide food for passing ships). Johnson & Stattersfield (1990) reviewed the fate of island endemic birds, and noted three extinct and several other endangered Pacific pigeons, including *M. meeki*—other pigeons known only from the fossil record include a new genus and species of pigeon from as far east as remote Henderson Island (Worthy & Wragg 2008). It seems probable that *M. meeki* only ever occurred on Choiseul and that missionaries' cats contributed significantly to the bird's demise—it must surely have been close to extinction when Meek collected it in 1904.

Sadly, cats, now established as feral on many of the larger islands in the region (Flannery 1995) probably sealed the fate of many ground-nesting birds—the infamous case of the Stephen Island Wren *Xenicus* [=*Traversia*] *lyalli* Rothschild, 1894, and the lighthouse keeper's cat is well known. Greenway (1958, 1967) believed *Microgoura* was 'most probably extinct'. Although Goodwin (1967) offered no opinion on this matter, he later (Goodwin 1983) remarked that he was 'reliably' informed that *M. meeki* was extant possibly as late as the 1980s. This seems rather unlikely. Knox & Walters (1994) noted that the species 'may have survived as late as 1965', and Parker (1972) said 'Although one cannot say even now that *Microgoura meeki* is extinct, the likelihood of its survival is small'. It is almost certainly the case that science would be unaware of the existence of *M. meeki* had it not been for Meek's fortuitous collection in 1904 of the only specimens now known. One wonders how many other animals were lost from the region before their presence could be registered.

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Dark Sharp-shinned Hawk *Accipiter striatus* from California is melanistic

by William S. Clark, Michael A. Patten & John C. Wilson

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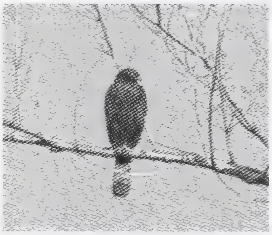

Figure 1. Melanistic Sharp-shinned Hawk *Accipiter striatus*, southern California, 1994 (John C. Wilson)

Patten & Wilson (1996) reported a dark Sharp-shinned Hawk *Accipiter striatus* that was represented as a colour morph previously unknown for this species (Bildstein & Meyer 2000). The claim was based on two photographs of a perched juvenile female, one included as their Fig. 1, taken in 1994 by JCW in southern California. Clark & Wheeler (1997) disagreed that this hawk was a dark morph and opined that it was a dark individual of the dark Pacific Northwest subspecies *A. s. perobscurus*. That possibility was denied by Dickerman (2004), who, after examining the original slides, could not determine 'if it is a morph, a phase, or, more likely, simply stained, but the bird definitely cannot be identified as *perobscurus*.'

MAP and WSC met recently and studied the original photographs, as Clark & Wheeler (1997) had only seen the published photo. We now agree that the hawk was not *A. s. perobscurus*, nor was it a 'dark morph', a term we feel applies best to a plumage persistent in a population rather than just aberrancy. We instead feel that the bird best fits the description 'melanistic'. Similar aberrant plumages have been described as melanistic for many bird species, for example: Pileated Woodpecker *Dryocopus pileatus* (Short 1965), Tree Swallow *Tachycineta bicolor* (Campbell & Siddle 2006), Blackcap *Sylvia atricapilla* (Berthold *et al*. 1996), and Cory's Shearwater *Calonectris diomedea* (Bried *et al*. 2005). It has also been used to describe aberrant plumages in raptors, for example: Northern Harrier *Circus hudsonius* (Howell *et al*. 1992, Olson & Osborn 2000), Osprey *Pandion haliaetus* (Clark 1998) and Black-breasted Buzzard (Eagle) *Geranoaetus melanoleucus* (Clark & Schmitt 2006).

There remains confusion about use of terms. For example, in his authoritative book on the subject, Majerus (1998) defined melanism 'to mean simply: the occurrence in a species of dark or black forms', and Butcher & Rohwer (1989) noted of color dimorphism or polymorphism that 'Many of these involve melanism'. By contrast, Thomsett (2007) asserted that 'The terms melanistic and dark morph should not be interchangeable if the aetiology of these conditions is not clear'. We contend that most scientific literature, bird guides, and handbooks use the term 'dark morph' for regularly occurring dark plumages of birds, a condition unknown in the *A. s. velox* subspecies of Sharp-shinned Hawk, although South American taxa in the Sharp-shinned Hawk species complex (e.g. *A.* [*s.*] *ventralis*) do possess a true dark morph. With the terminology clarified, we therefore conclude that this Sharp-shinned Hawk was a melanistic individual, the first to be recorded in North America.

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First nest description of the Yellow-breasted Antpitta *Grallaria flavotincta* in north-west Ecuador

by Harold F. Greeney, Mery E. Juiña J., Segundo M. Imba Lliquin & Jane A. Lyons

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Grallaria antpittas are poorly known members of the Grallariidae, distributed throughout the Andes and comprise 31 species. Despite many recent contributions to our understanding of their breeding biology (e.g., Freile & Renjifo 2003, Greeney & Martin 2005, Martin & Greeney 2006, Solano-Ugalde *et al.* in press), the breeding biology of most species is poorly documented (Greeney *et al.* 2008). Yellow-breasted Antpitta *G. flavotincta* inhabits humid montane forests (1,300–2,350 m) from north-west Colombia to north-west Ecuador (Hilty & Brown 1986, Ridgely & Greenfield 2001). While it is a range-restricted species, Yellow-breasted Antpitta is not considered globally threatened (BirdLife International 2009), but some authors consider the species to warrant Near Threatened status (Krabbe & Schulenberg 2003, Freile *et al.* in press). Other than specimens collected in breeding condition in June in Colombia (Krabbe & Schulenberg 2003), nothing has been published on its breeding biology. Here we describe a nest of Yellow-breasted Antpitta from north-west Ecuador.

Methods and Results

On 20 January 2009, SMIL found a nest of Yellow-breasted Antpitta at Reserva Las Gralarias (00°00′06″S, 78°43′09″W), at an elevation of 2,050 m, near Mindo, prov. Pichincha. At the time of discovery, the nest contained two turquoise eggs. He did not examine them closely, but they appeared lightly spotted. It is unclear, however, to what extent staining from the nest or eclosion fluids may have contributed to these markings. We took measurements and photographed the nest on 14 February, when it contained two nestlings that we estimated to be *c.*8 days old based on our experience with other *Grallaria*. The nestlings (Fig. 1) were pale-skinned with patches of black down on the dorsum. Their primary feathers had not yet broken their sheaths, but would probably have done so within the next 24 hours. Their mouth linings and gape were bright crimson-orange, contrasting starkly with the dark interior of the nest. They weighed 29.8 and 32.7 g. On the morning of 17 February the nest still contained two nestlings, but six days later the nest had partially fallen from its position and several feathers were found on the rim. While it is possible that the nestlings had fledged by this time, we feel it is likely that a predator destroyed the nest.

The bulky, open-cup nest was composed mostly of green moss and fern leaves intermixed with a few sticks, leaf rachises and vines. It was lined with dark rootlets and a few bare fern rachises. The nest was 1.5 m above ground and constructed against the side of a 9 m-tall living tree trunk that was 13 cm in diameter at breast height. The substrate, however, was made substantially larger by copious epiphytes and vines clinging to the trunk at the height of the nest. These created a platform of vegetation that provided a solid support for the nest. It appeared that the nest had been built into a natural depression atop the solid tangle. Externally, the cup measured 21 cm wide by 19 cm front to back, and 15 cm tall. The neatly formed cup measured 13 cm wide by 12 cm front to back, and 7.5 cm deep. The forest surrounding the nest was mature second growth, with an open canopy *c.*20 m in height. The understorey was relatively dense, with many tangles and fallen trees. A few epiphytic

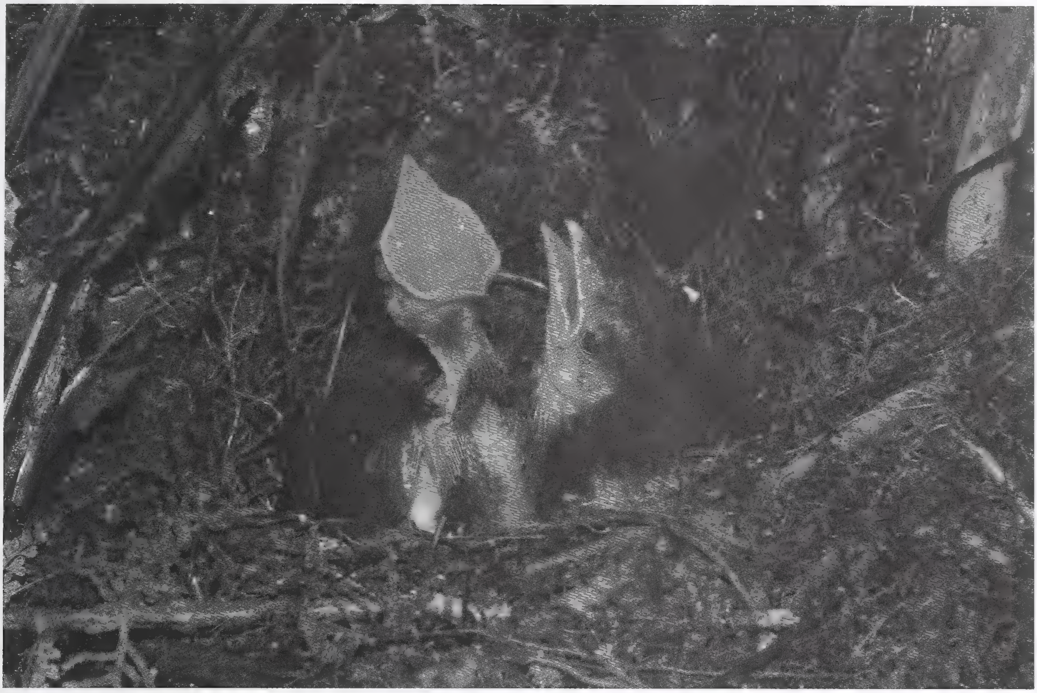

Figure 1. Nest with two young Yellow-breasted Antpittas *Grallaria flavotincta*, Reserva Las Gralarias, northwest Ecuador, 14 February 2009 (Harold F. Greeney)

ferns directly above the nest provided roughly 25% cover, but the nest was otherwise relatively visible from most directions.

Discussion

Unsurprisingly, the nest of Yellow-breasted Antpitta is a deep, bulky cup similar in form to those nests of other *Grallaria* that have been described (Greeney *et al.* 2008). In that it was well supported, the nest is most similar to species such as Rufous Antpitta *G. rufula* (Greeney & Gelis 2005), White-bellied Antpitta *G. hypoleuca* (Price 2003), Variegated Antpitta *G. varia* (Protomastro 2000), Pale-billed Antpitta *G. carrikeri* (Wiedenfeld 1982) and Great Antpitta *G. excelsa* (Koefed & Auer 2004). The nest's composition, predominantly of moss and humid materials, most recalls nests of Rufous Antpitta (Whitney 1992, Greeney & Gelis 2005), Great Antpitta (Koefed & Auer 2004), Tawny Antpitta *G. quitensis* (Greeney & Martin 2005) and Stripe-headed Antpitta *G. andicolus* (J. Fjeldså *in* Greeney *et al.* 2008), as well as some nests of Moustached Antpitta *G. alleni* (Freile & Renjifo 2003, Londoño *et al.* 2004, Greeney & Gelis 2006) and Scaled Antpitta *G. guatimalensis* (Miller 1963, Rowley 1966, Dobbs *et al.* 2001, 2003). Unfortunately, for most species, so few nests are described that the phylogenetic importance of composition and placement suggested by Greeney *et al.* (2008) remains unclear.

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